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Station #12

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# ENGINEERING DATA TRANSMITTAL

Page 1 of 1

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7. Abstract


This aquifer plan describes single- and multiple-well constant discharge tests that will be performed in the 200 West Groundwater Aggregate Area to determine and confirm hydraulic properties of the uppermost unconfined aquifer.

Swanson, L. C., 1992, *Aquifer Test Plan for the 200 West Groundwater Aggregate Area*, WHC-SD-EN-TP-021, Rev. 0, Westinghouse Hanford Company, Richland, Washington.




9. Impact Level 3Q

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FIGURES:



TABLES:

# 1.0 INTRODUCTION

The 1991 revision to the Tri-Party Agreement (Ecology et al. 1991) requires that an aggregate area approach be implemented in the 200 Areas based on the *Hanford Past Practice Investigation Strategy* (DOE-RL 1992a). The *Hanford Past Practice Investigation Strategy* was developed between Ecology, EPA, and DOE to streamline the existing RI/FS and RFI/CMS processes and promote the use of interim actions to accelerate cleanup. For the 200 Areas the first step in the strategy is the conduct of Aggregate Area Management Studies (AAMS) to support the Hanford Past Practice Investigation Strategy decision-making process.

The AAMS program for the 200 Areas consisted of a series of 10 AAMS for 8 source and 2 groundwater aggregate areas, and limited field screening investigations. The studies involved the search, compilation, and evaluation of existing operational and environmental data. Based on this information, decisions were made regarding which Hanford Past Practice Investigation Strategy path (i.e., expedited response action, interim remedial measure limited field investigation, and final remedy selection) to pursue for further actions at individual waste sites. The results were presented in a series of 10 AAMS Reports.

The *200 West Groundwater Aggregate Area Management Study Report* (DOE-RL 1992b) decisional draft "recommends that site-specific groundwater computer modeling capabilities be developed at the aggregate area (i.e., 200 West) scale to simulate the details of the groundwater flow system. The primary purpose for developing the model is to support the evaluation of groundwater remedial alternatives and remedial action design. Such capabilities will also support the Hanford Past Practice Investigation Strategy decisions-making process." Because of a general lack of information concerning the vertical extent of groundwater contamination and large-scale physical properties of the aquifer, limited field investigations including aquifer testing and plume definition activities are planned.

The purpose of this report is to provide a test plan for assessing aquifer properties (primarily the hydraulic conductivity) in support of groundwater model development. Aquifer testing will focus primarily on the U-1 and U-2 crib areas near the uranium (U), technetium (Tc), and nitrate (N) IRM plumes beneath the U plant Aggregate Area, although testing will also cover a broader portion of the 200 West Area to fit model data needs.

One of the principle input parameters to the groundwater model is the saturated hydraulic conductivity. To determine representative values of hydraulic conductivity, constant discharge (primarily single-well) aquifer tests will be performed in the top of the unconfined aquifer at existing wells. It is anticipated that future aquifer tests will include testing in the deeper zones to provide three-dimensional information on the distribution of the hydraulic conductivity.

## 1.1 SCOPE

This test plan provides technical and administrative guidance for performing single-well and multiple-well aquifer tests in the uppermost aquifer system beneath the 200 West Area. Specific items included in the test plan are test design requirements, field operational requirements, implementation requirements, and data collection guidelines for the aquifer testing. The test plan was prepared in accordance with Environmental Investigation Instruction (EII) 10.1, "Aquifer Testing" (WHC 1988a).

The field testing will consist of a slug test, a step-drawdown test, and a constant discharge test at each well. The slug tests will be used to confirm previous slug test results, and as a check against hydraulic conductivities determined from the constant discharge tests. Step-drawdown testing will be used to determine an optimum discharge rate for the constant discharge test. Constant discharge tests will be performed to estimate the hydraulic conductivity of the aquifer. These tests will usually be single-well tests, but when possible observation wells will be used.

Aquifer tests are planned at seven wells. The reasons for selecting these particular wells and locations are described in Section 2.1. Field testing is expected to commence in February and be completed by May 1993. A site visit will be made to each test site prior to testing to determine the suitability of the wells for aquifer testing.

## 1.2 PURPOSE AND OBJECTIVES

The primary purpose of the aquifer tests is to provide estimates of hydraulic conductivity to be used in the groundwater numerical model. The hydraulic conductivities will enlarge the groundwater model data base by filling in data gaps (i.e., areas where hydraulic conductivity values are currently unavailable), or confirming hydraulic conductivity values determined from previous tests.

The field program generally will consist of single-well constant-discharge tests to evaluate aquifer hydraulic conductivities. This test method is expected to yield reasonable values of hydraulic conductivity. At sites where observation wells will be used, it may be possible to estimate other aquifer parameters, such as the vertical hydraulic conductivity and the storage coefficient. These later parameters will also be used in the groundwater model.

The general objective of this test plan is to provide administrative and technical guidance for the field testing. Specific objectives for the test plan are to:

1. Present a basic overview of the hydrogeology of the 200 West Area
2. Describe the rational for test site selection
3. Select a list of proposed test sites
4. Summarize the construction details of the proposed test wells

5. Present the general sequence of field testing activities

6. Specify test design, equipment, and data collection requirements

7. Discuss the handling of purgewater disposal

8. Identify applicable procedures and quality assurance guidelines.

# 2.0 DESCRIPTION OF TEST SITES

This section describes the general hydrogeology of the 200 West Area, lists the criteria for selecting the aquifer test well locations, the proposed location of the test sites, the construction of the test wells, and limitations of the testing methods and program.

## 2.1 GENERAL HYDROGEOLOGY OF THE 200 WEST AREA

A brief description of the hydrogeology for the 200 West Area is presented below. For greater detail refer to the 200 West Area Groundwater Aggregate Area Management Study Report (DOE/RL-92-16).

The top of the unconfined aquifer (in the 200 West aggregate area) is situated within the Ringold Formation gravel unit "E" (Lindsey et al. 1991). This unit is a clast-supported granule to cobble gravel in a sandy matrix, often with intercalated sands and muds. The bottom of the unconfined aquifer is defined by either the lower mud sequence of the Ringold Formation (if present) or the top of basalt.

Movement of groundwater in the unconfined aquifer in 200 West Area occurs primarily in the Ringold Formation. Groundwater flow direction is generally eastward, but more to the northeast in the northern part of the 200 West Area, and more to the southeast in the southern part of the 200 West Area (Figure 1). A groundwater mound predominates in the south-central area of the 200 West Area creating an area of radial flow. The mounding is a remanent signature of the U Pond, which was decommissioned in 1984. Water levels at the proposed test wells are about 260 ft $\pm$30 ft below land surface.

The test wells are located in areas with varying hydraulic conductivities (Figure 2). Conductivities for the test wells expected to range from 1 to 5,000 ft/d (Figure 2). An area of high hydraulic conductivity in the central portion of 200 West Area just north of the U Plant may be significant for pump-and-treat remediations, grout curtains, etc.

Figure 1. June 1991 Water-Table Map of the 200 West Area (after WHC 1992).

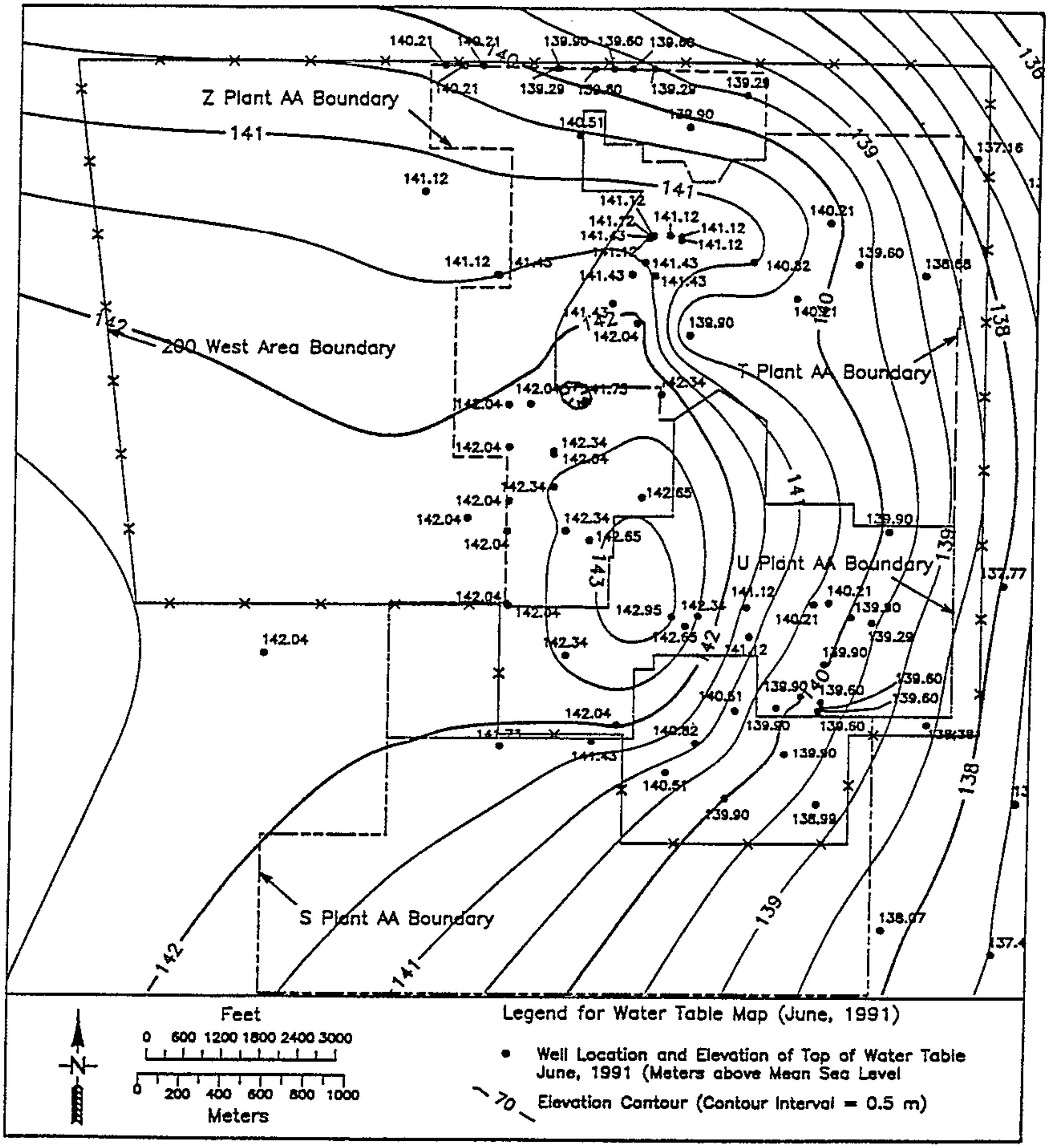
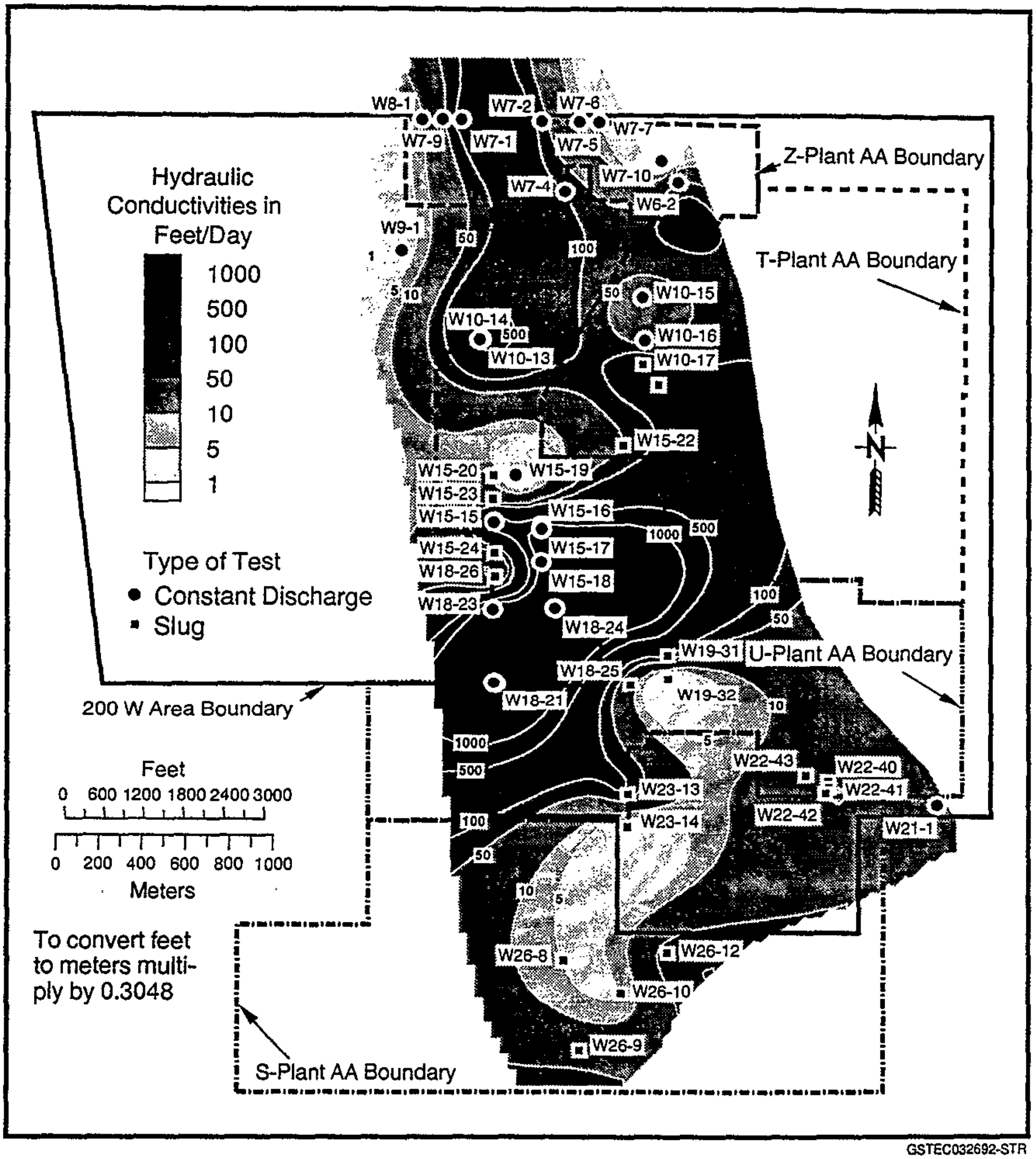


Figure 2. Hydraulic Conductivity Distribution Map of the 200 West Area (after WHC 1992).



## 2.2 SELECTION CRITERIA AND PROPOSED TEST LOCATIONS

In general, the test wells and locations were based on the data requirements of the groundwater numerical model (i.e., to confirm hydraulic conductivities and fill in data gaps). Prominent consideration was also given to the area around the U-1 and U-2 cribs where the interim remedial measure is planned. However, the lack of existing wells in the U crib area precluded any testing directly downgradient.

Existing wells were used in all cases because of resource and time limitations. The installation of new characterization wells is costly and requires significant lead time to plan for drilling and aquifer testing. The selection criteria can be summarized as follows.

1. Only existing wells will be tested.

2. The wells must be screened or perforated in the top of the unconfined aquifer, so the data collected at each site will be consistent with other aquifer test results in the model data base.

3. Testing near the U-1 and U-2 cribs is desired (this is the focus of the interim remedial measure).

4. The test results should provide confirmatory values of hydraulic conductivity for data in the groundwater model data base (which consists of primarily slug test results).

5. The test results should fill in data gaps for the groundwater model and in particular be useful for defining boundary conditions of the model.

6. Testing will be performed primarily in the eastern portion of 200 West Area, which is the general direction of contaminant movement from the 200 West Area, and the primary area of concern for the groundwater model.

7. Better definition of the lateral extent of an east-west trending high hydraulic conductivity zone just north of the U-1 and U-2 cribs is desired.

8. Multiple wells should be used if possible, which generally provides more representative estimates of hydraulic conductivity, and may also supply additional parameters (vertical hydraulic conductivity and the storage coefficient) that can be incorporated into the groundwater model.

Given these criteria and the limited resources for testing, seven test locations were selected (Table 1). Additional sites (to-be-determined wells) could be selected later if time permits and sufficient resources are still available. Also, other wells may be chosen later for testing if other important data requirements for the model are identified later.

Table 1. Summary Table of Criteria for Selecting Test Wells.

| Selection Criteria | 299-W12-1 | 299-W11-10 | 2939-W14-10 | 299-W22-41 | 699-W38-70 | 699-W35-70 | 699-37-82A |
|---|---|---|---|---|---|---|---|
| Existing well | X | X | X | X | X | X | X |
| Screened at top of aquifer | X | X | X | X | X | X | X |
| Near U-1/U-2 crib | | | X | X | X | X | |
| Confirms conductivity | | | | X | | | X |
| Fills data gap | X | X | X | | X | X | X |
| Eastern side of 200 West | X | X | X | | X | X | |
| Defines high conductivity area | | | X | | | | X |
| Multiple wells | | | | X | | | X |

A well assessment will be performed at each proposed test site prior to testing to determine the suitability of each well for testing. If one or more of the proposed wells are inadequate for testing, alternative locations may be chosen. Alternate wells will be chosen according to the criteria listed above and tested using the same general approach described in this test plan.

Table 2 lists the current proposed wells and general well completion information for each of the aquifer test wells. Figure 3 shows the locations of the wells in the 200 West Area. The non-pumping wells listed in Table 2 are observation wells that may be close enough to a pumping well to warrant monitoring during the testing activities.

## 2.3 WELL CONSTRUCTION

Most of the proposed aquifer test wells were constructed before 1981. Only one well, 299-W22-41, was completed in accordance with the Washington State Department of Ecology construction standards (Chapter 173-160 WAC, 1990). Table 2 lists information on well completions. Appendix A contains as-builts and well summaries (as available) for the proposed test wells.

9 3 1 2 9 5 9 0 0 1 3

Table 2. Well Construction Summary Information for the Aquifer Test Wells (see Figure 3 for locations).

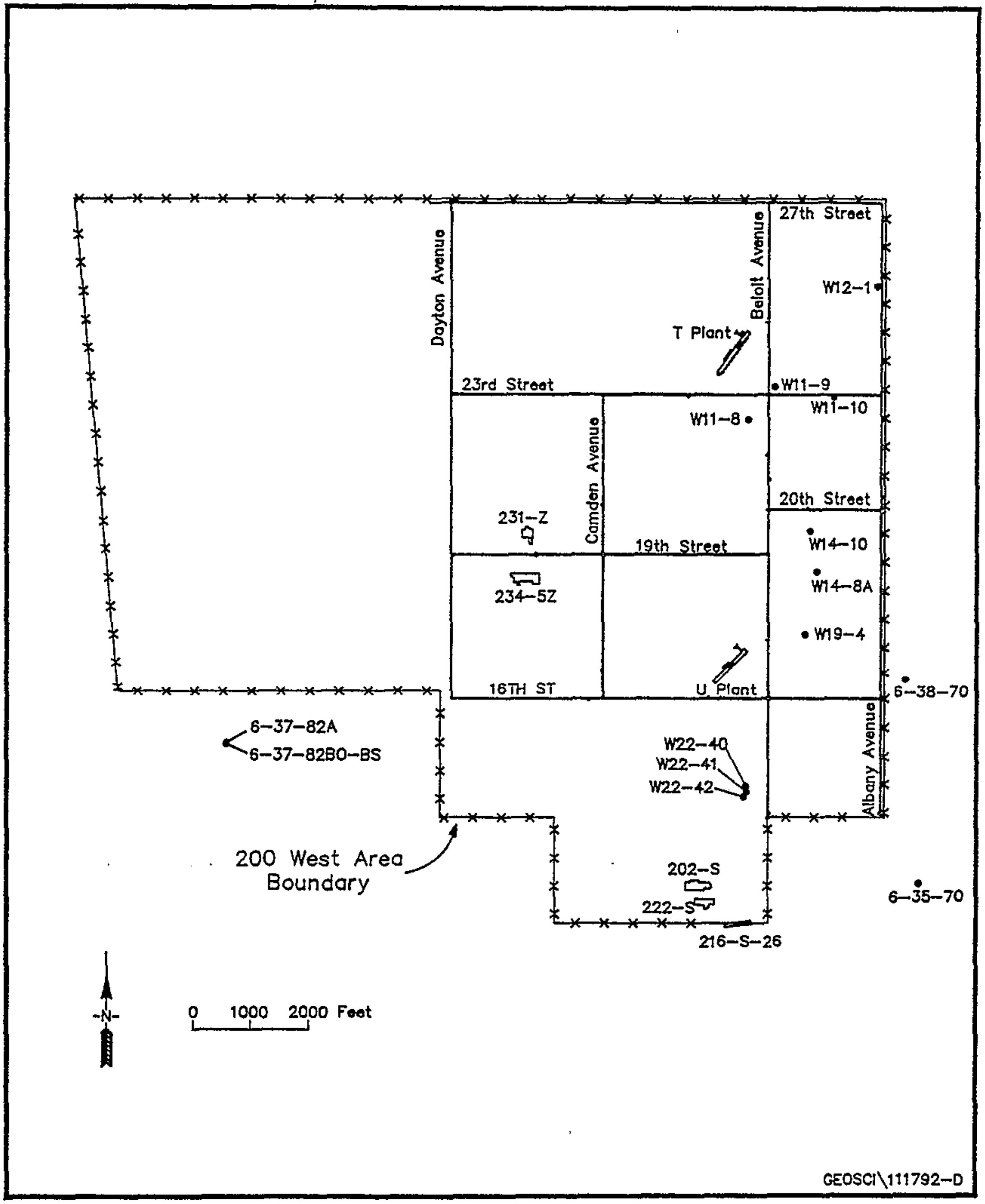
| Permanent well # | End drilling date | Completion depth (ft) | Total depth (ft) | Depth to water (ft) | Screen interval (ft) | Sandpack interval (ft) | Elevation brass cap | Casing size (in.) |
|---|---|---|---|---|---|---|---|---|
| 299-W14-10* | JUN 81 | ~325 | 330 | 263, 1991 | 260-275P | ND | ND | 8"-330<br>10"-242 |
| 299-W11-10* | MAR 56 | 305 | 307 | 270, 1991 | ~256-304P | ND | ~726.8 | 8"-305 |
| 299-W12-1* | APR 56 | ~310 | 314 | 273, 1991 | ~274-309P | ND | ~724.2 | 8"-310 |
| 299-W11-8& | NOV 53 | 313 | 315 | 260, 1965 | 260-310P | ND | ND | 8"-313 |
| 299-W11-9& | FEB 54 | 297 | 297 | 262, 1991 | 6" Liner<br>275-297P | ND | ~721 | 8"-270<br>6"270-297 |
| 699-37-82A* | FEB 62 | 408? | 408 | ND | 400-408? | ND | 636.95 | 1.5" |
| 699-37-82BO+! | OCT 64 | 184? | 296? | ND | 165-185 | ND | ND | 1.5" |
| 699-37-82BP+! | MAY 64 | 344? | 560? | ND | 540-560 | ND | 636.30 | 1.5" |
| 699-37-82BQ+! | MAY 64 | 184 | 410 | ND | 390-410 | ND | 636.30 | 1.5" |
| 699-37-82BR+! | MAY 64 | ? | 330 | ND | 310-330 | ND | 636.30 | 1.5" |
| 699-37-82BS+! | MAY 64 | 414? | 250? | ND | 230-250 | ND | 636.50 | 1.5" |
| 299-W22-41* | MAY 90 | 245 | 245 | 231, 1991 | 224-245<br>wire wrap<br>5 slot | 220-243<br>40-100 | 688.77 | 10"-132<br>8"-244 |
| 299-W22-40+ | MAY 90 | 244 | 245 | 231, 1992 | 224-244<br>wire wrap<br>10 slot | 218-242<br>40 | 689.22 | 10"-143<br>8"-245 |
| 299-W22-42+ | MAY 90 | 243 | 243 | 230, 1991 | 223-243<br>wire wrap<br>10 slot | 219-243<br>40 | 688.20 | 10"-137<br>8"243 |
| 699-35-70*! | SEP 48 | 253 | 325 | 240, ? | 235-320P<br>6" Liner<br>233-253 | ND | 693.72 | 8"-? |
| 699-38-70*! | JUN 57 | 300 | 413 | 270, 1987 | 255-380P<br>Plug @300 | ND | ND | 8" |

ND=Not Documented
P=Perforations
*=pumping well
+=observation well

&=alternate pumping well
!=graphic construction information not available
?=interpretation of construction information is questionable

All other wells on table are for information, due to their location near a test well.

Figure 3. Location Map for the Proposed Aquifer Test Wells in the 200 West Area.



Many of the wells were constructed of 8-in. carbon steel casing, which was perforated at a specific interval(s) of interest at the time of completion. One well, 299-W22-41, was completed in accordance with Washington State well construction standards. Construction materials in this well included 4-in. stainless steel pipe and a continuous wire-wrap 10-slot stainless steel screen. The completion interval for this well was the top 20 ft of the unconfined aquifer.

Most of the wells were drilled using a cable tool drilling rig. Some wells have been modified through time by the addition of liners and plugs. The current status and condition of the wells will not be known until a site visit is made and, in some instances, a camera survey is conducted. After the well assessment, a decision will then be made on whether the well is suitable for testing. The criteria for this decision are listed in Section 3.1.

## 2.4 TESTING LIMITATIONS

Most of the aquifer tests will consist of single-well constant discharge tests. In one case (or maybe two), a multiple-well test will be performed. The multiple-well test may furnish information on the vertical hydraulic conductivity and the storage coefficient of the aquifer. Some general limitations of the testing are identified below.

- The test results will only apply to the top of the unconfined aquifer and should not be considered representative of the entire saturated thickness. This restriction is chosen by design, to ensure consistency with past test results. Most historical aquifer testing was performed in the top of the unconfined aquifer, and it is data from these tests that support the groundwater model. This restriction is also a necessity, because most of the wells in the 200 West Area are completed in the top of the unconfined aquifer, and aquifer testing will be conducted using existing wells.

- Aquifer testing will not be site-specific to the U-1 and U-2 cribs, which is the source of the several contaminant plumes, and the attention of the interim remedial measure. Even though this was a criterion considered for selecting test wells, very few wells are present in this general area. Resource limitations precluded the installation of characterization wells near the cribs.

- The estimated hydraulic conductivity for the single-well tests will be approximations of the true hydraulic conductivity, because several key assumptions of the single-well test analysis are violated under the set test conditions. One significant assumption is the requirement for a fully penetrating well screen (or perforations). Analytical methods are available to handle this variation, but only for multiple-well tests. The analysis report will qualify the data results with respect to the analysis assumptions.

Even with these limitations, the aquifer test results will provide reasonable estimates of hydraulic conductivity for the top of the unconfined aquifer. Given the proposed intent of the groundwater modelling effort (an evaluative tool), the relatively large area covered by the model, and the use of a plan-view two-dimensional model, the hydraulic conductivity data should meet the level of detail required by the groundwater model.

In addition, it is currently perceived that most of the contamination from the U-1 and U-2 cribs is situated at the top of the unconfined aquifer. If this is a correct assumption, then modeling the top of the unconfined aquifer is a reasonable effort for remedial alternatives.

Future aquifer testing near the U-1 and U-2 cribs should include vertical profiling of the hydraulic conductivity. This testing could be accomplished with two characterization wells spaced at an appropriate distance, so one of the wells could be used as an observation well. The wells also could be multi-functional and might be used in a pump-and-treat pilot test.

# 3.0 DESCRIPTION OF TEST ACTIVITIES

This section discusses the types of tests that will be performed at each well, the sequence of testing activities, and the estimated schedule for completing the field work. Figure 4 is a generalized flow diagram showing the overall sequence of test activities.

## 3.1 TEST TYPES

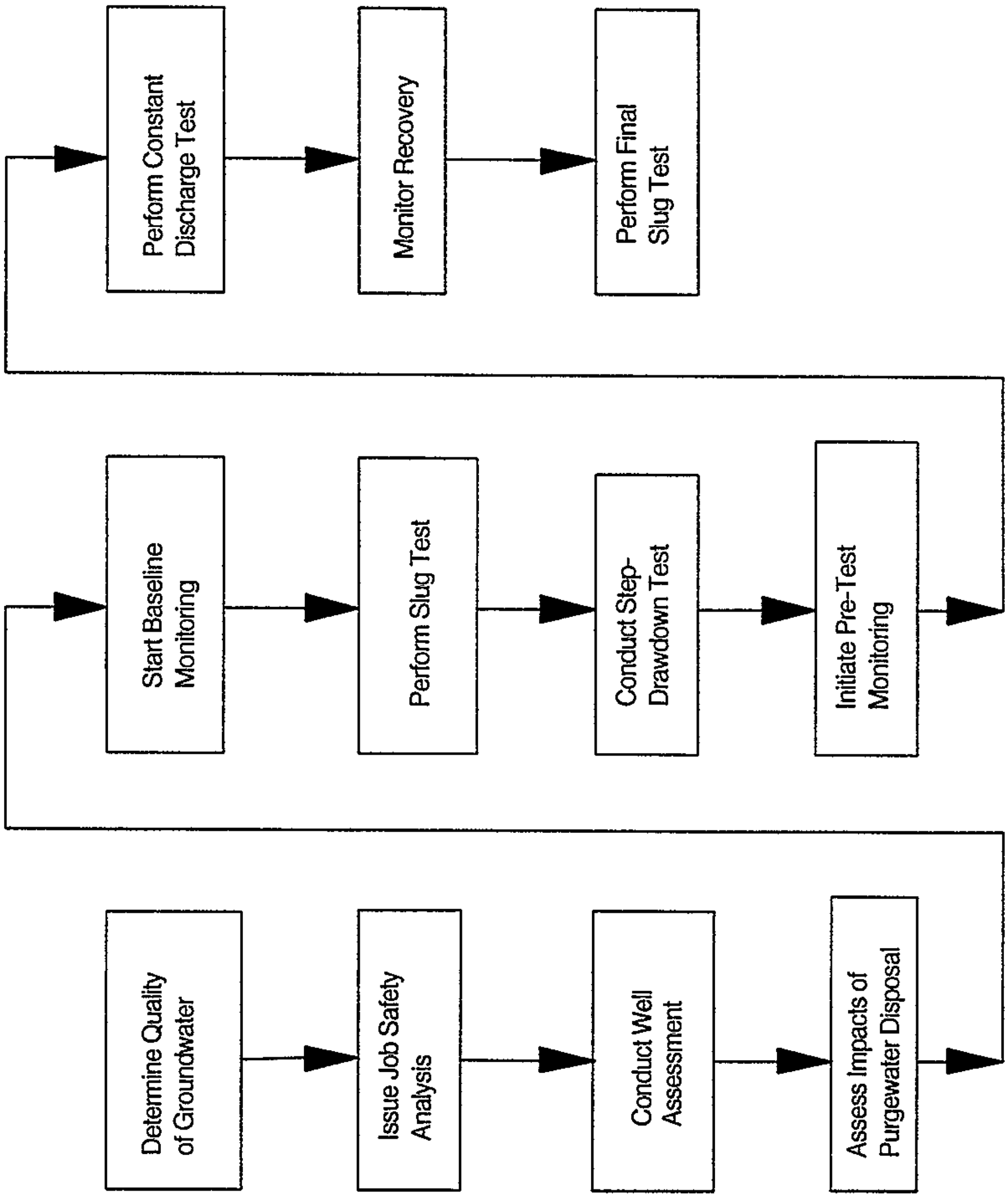
Ideally, hydraulic conductivity estimates from the slug test data should equal values calculated from the constant discharge test. However, slug test results are readily affected by near-borehole conditions that may not be representative of overall aquifer properties. Influences such as drilling effects, well completion activities, and natural formational heterogeneities can contribute to variations in the hydraulic conductivity. Slug tests by testing only a small portion of the aquifer are readily influenced by these factors.

For this reason, the primary testing method chosen to determine the hydraulic conductivity is the constant discharge test. This technique consists of discharging groundwater from a well and recording the corresponding drawdown in the pumping well and, if available, at any nearby observation wells. The test encompasses a larger portion of the aquifer and therefore provides a more representative value of hydraulic conductivity.

The testing sequence will consist of an initial slug test (at the pumping well and all observation wells), a step-drawdown test, a constant discharge/recovery test, and a final slug test. The slug test and step-drawdown tests will provide preliminary information for planning and conducting the constant discharge test, including an initial estimate of hydraulic conductivity and an optimum rate of discharge.

At most of the well, neither the hydraulic conductivity nor the transmissivity has been determined. One exception is well 299-W22-41, where the transmissivity was estimated to be 140 $ft^2$/d from a previous slug test (WHC 1992). A constant discharge test has not been performed at this well.

Figure 4. Flow Chart Showing the Sequencing of Aquifer Test Activities.



At well 299-W22-41, and possibly 699-37-82A, observation wells will be available, making these multiple-well tests. Some historical information is available for aquifer testing in well 699-37-82A, reported in Graham et al. (1981). An evaluation of the Graham test data will be performed to determine if an additional aquifer test is necessary at this site.

The primary objective for the aquifer tests is to determine aquifer hydraulic parameters. For single-well constant-discharge tests, only the hydraulic conductivity (tranmissivity) can be determined (an inherent limitation of the method). For multiple-well test(s), additional parameters such as the vertical hydraulic conductivity, the specific yield, and elastic storage coefficient may be estimated.

Slug tests will provide an initial estimate of the aquifer hydraulic conductivity. The slug test conductivities will be compared to conductivities calculated from the constant discharge test to help evaluate the correspondence between these test types.

A pre-test site visit and well assessment is planned to verify the condition and adequacy of the older wells for testing and to check the status of the newer wells. During the well assessment the following tasks should be performed:

- Measure the depth to water
- Tag the bottom of the well
- Note any obstructions in the wells
- Draw a well-head diagram (a Polaroid picture is also recommended)
- Measure the distance to nearby wells (which should be located within 100 ft of the pumping well).

If the initial evaluation of the wells indicates that testing is not feasible (i.e., there is sand fill up, the desired interval is not accessible, or hydraulic head elevations are not distinct in wells completed as piezometers), the well will be eliminated as a test site and no further evaluation is required. If the evaluation does show the well to be viable, then the well may be assessed by running a camera survey.

## 3.2 SEQUENCE OF FIELD ACTIVITIES

Field activities at each site will begin with the well assessment and, if favorable, end with the final slug test. Figure 4 is a generalized flow chart placing each activity in chronological order. Some of the field activities can be completed as a group: for example, most of the well assessments can be finished before any aquifer testing begins.

Aquifer testing will be initiated only after several administrative tasks are completed. These tasks include the following:

- A groundwater chemistry evaluation to determine how to handle purgewater produced during testing

- An environmental assessment to determine the impact of purgewater on endangered, threatened, or sensitive plant and animal species if water is to be disposed to the ground
- A job safety analysis to determine the safety requirements for each site.

### 3.3 TEST SCHEDULE

Aquifer testing is expected to begin after the first of the calendar year. Testing must be completed by May 1, 1993 to allow enough time for final data reduction and analysis, and to provide input into the final modelling report that is due at the end of the fiscal year. Well assessment activities can begin any time after the applicable administrative tasks listed above are completed.

A preliminary analysis (plotting) will be performed in the field to determine the test duration and as an aid to the final analysis performed in the office. Estimates of hydraulic conductivity and other parameters, as applicable, will be forwarded to the modelling team as soon as possible for assimilation into the groundwater model. The amount of time expected to finish each field task is estimated as follows:

| | |
|---|---|
| Baseline Monitoring | 3 to 5 days |
| Slug Testing | 0.5 days |
| Step-Drawdown Testing | 1 day |
| Pre-Test Monitoring | 1 to 3 days |
| Constant Discharge Testing | 1 day |
| Recovery Monitoring | 2 to 3 days |
| Final Slug Testing | 0.5 days |
| Maximum Total Time/Well | 14 days |

## 4.0 TEST REQUIREMENTS

The following subsections describe specific requirements for the aquifer tests such as determination of pumping rates; the selection of the pump; the equipment setup; the length of each test; and baseline, pre-test, and post-test monitoring.

### 4.1 DISCHARGE RATES AND PUMP SELECTION

The primary purpose of the step-drawdown testing will be to estimate the optimal discharge rate for the longer-term aquifer test. Two to five steps at 60 to 90 minutes each may be necessary to make this determination. A reasonable drawdown for the long-term test would be more than 5 ft in the pumping well, not exceeding 50% of the screen length, and at least 2 to 3 ft in the observation well (if available).

The selection of the pump for each well will ultimately depend on the results of the step-drawdown tests. An initial best estimate of the discharge rate (and therefore pump selection) will be based on the estimated hydraulic conductivity from the slug test. The pump used for the step-test will be selected from drawdown projections based on the slug test results.

The riser pipe from the pump should have a backflow valve or a surface valve installed to prevent water in the pipe draining back into the aquifer after the pump is shut off. At the minimum, a valve should be installed at ground surface that can be closed at the end of the pumping period.

## 4.2 EQUIPMENT SETUP

The wells will not require any structural modifications for aquifer testing. It may be advantageous to install a packer in the observation well during slug testing in the pumping well to eliminate wellbore storage effects, and thereby increase the ability to measure a response.

For the step-drawdown tests and constant discharge tests, the pump should be installed within 5 ft of the bottom of the screen, or at a depth that is at least 3-5 ft below the level of maximum expected drawdown. This setting should provide an adequate buffer to prevent cavitation.

A calibrated transducer should be used in the pumping and observation wells for baseline monitoring, pre-test water-level monitoring, and during recovery monitoring. Calibrated equipment other than flow measurement devices shall be controlled as described in EII 3.2 of WHC-CM-7-7 (WHC 1988a). The transducer should be located in the well as stated in EII 10.1 (aquifer testing).

The transducers must record at a log-scale frequency at the start of the slug tests, step-drawdown tests, constant discharge tests, and the beginning of the recovery monitoring, with a maximum recording frequency not to exceed 1 hour. Recording frequencies for baseline monitoring and pre-test monitoring should be set at a maximum interval of 1 hour.

A calibrated flow measurement device (which may be an orifice) must be used to monitor the discharge rate. The error of the flow measurement device must be less than or equal to ±10% of the flow.

If a rotor meter-type flow meter is used for low flow rates (<10 gal/min), the factory calibration is acceptable, provided the flow rate is confirmed with a stop watch and container of known volume while running the test. If feasible, field checks should be made to confirm proper operation of any flow measurement device. One useful field check would be using the weighing tank method, where the weight change of water is measured over a specific period of time.

Flow rates should be recorded at least every 5 minutes at the start of the test, and at a maximum of 30- to 60-minute intervals after the first 30 minutes. If a transducer can be used for recording flow rates, the rate should be set to a logarithmic recording frequency at the start of the test with a maximum rate of every 30 to 60 minutes.

Flow measurement devices must be installed with the correct length of straight run pipe upstream and downstream from the device in accordance with the manufacturers recommendation. Expected flow rates in the 200 West Area are expected to range from 1 to 50 gal/min based on the estimated hydraulic conductivities (Figure 2).

## 4.3 LENGTH OF TEST

In general, the long-term test should run until near steady-state conditions are achieved (determined using semi-log plot and log-log plots). The straight line will become evident after the effects of delayed drainage become minimal. It is anticipated that the test will run from 4 to 8 hours, but may require as long as one day, depending on aquifer conditions. Final determination on the length of the test is at the discretion of the Aquifer Test Lead. The rationale for stopping the test will be recorded on the field activity report.

At wells where the transmissivities are relatively low and a larger diameter casing is present (8 in. or greater), borehole storage effects will dominant the early time data. Papadopulos and Cooper (1967) give a criteria for estimating the amount of time that wellbore storage impacts the drawdown: $t < 25\ r_c^2 / T$ (modified after Weekes [1977]). In this equation, $r_c$ = radius of well casing (L) and T = transmissivity (L/T). This equation can be used to estimate when the wellbore storage is no longer dominant. In the field, a unit slope on a log-log graph of the data will indicate borehole storage is dominating the drawdown data. It is recommended that the test continue at least one 1 log cycle past this effect.

## 4.4 BASELINE AND PRE-TEST MONITORING

Before initiating the slug test and starting the constant discharge test, baseline and pre-test water-level trends must be established. A pressure transducer at a preferred recording frequency of 1 hour should be used to record baseline water-level trends for 3 to 5 days, and 1 to 3 days before starting the constant discharge test. Steel tapes and electric tapes used for measuring water levels must meet the calibration/standardization requirements in EII 10.2. Barometric monitoring will also be included over the span of the testing, beginning at the time of the baseline monitoring.

## 4.5 POST-TEST MONITORING

After pumping is terminated, water-level data collection will continue throughout the recovery period until a dynamic equilibrium is re-established, or the recovery trend is clearly defined. In most cases full recovery is expected to occur in about 2 or 3 days. The final slug test can then be performed at the well.

## 5.0 PURGEWATER REQUIREMENTS

Purgewater will be handled in two ways, depending on the quality of the water at the test well. If the groundwater at the test well is designated as uncontaminated, then the water can be released to ground surface at least 100 ft away from the well. Recharge to the aquifer during the test is not expected to occur over the length of the test (because the top of the water table is so deep), or transported to a predetermined area where disposal to the ground is acceptable. If the groundwater is determined to be contaminated, then the water will be contained in a purgewater truck and transported to an acceptable disposal facility.

Geosciences will document the quality of the groundwater for each well, and thereby determine the method of disposal. Test sites where both the purgewater is contaminated and the transmissivity of the aquifer is relatively high will probably not be tested because of the large volumes of purgewater that will be produced. At this time, no satisfactory method for handling large volumes of contaminated purgewater is available.

A sample of the purgewater should be collected at the end of each test for information and analyzed at least for nitrate and total activity. Total estimated volumes of generated purgewater are about 70,000 gal assuming seven tests, an average of 20 gal/min discharge, and an average test time of 8 hours.

## 6.0 PROCEDURES AND DOCUMENTATION

Testing documentation and procedural control is covered by EII 10.1. Field activity reports will be used to record daily field activities during aquifer testing per EII 6.1. Standard activities and any unusual observations should be recorded on the daily activity log. Data collected during the testing will be stored according to EII 1.6 and incorporated into the project file after testing is completed.

A report on the aquifer test results will be issued as a subsection of the more extensive 200 AAMS groundwater modelling report. The current required release date for the modelling report is the end of fiscal year 1993.

## 7.0 QUALITY ASSURANCE

Data quality is controlled by this test plan and EII 10.1 on Aquifer Testing. The data at the test wells can be reproduced if the initial test fails by re-running the test. Some of the test sites will require an evaluation of the impact to endangered, threatened, and sensitive species by water disposed to the ground. The quality assurance documents that cover the test activities are the Quality Assurance Manual (WHC 1988b), and the Environmental Engineering, Technology, and Permitting Function Quality Assurance Program Plan (WHC 1990). This aquifer test plan and the aquifer testing is assigned an impact level of 3Q.

## 8.0 RESPONSIBILITIES

Specific responsibilities for the testing activities are contained in EII 10.1. Personnel performing individual test activities will be identified in the daily field activity log. Geosciences personnel will be the primary lead for aquifer testing and will direct and schedule field activities. Geosciences is responsible for evaluating the quality of groundwater that will be produced from each well.

Environmental Field Services (EFS) will support the testing by conducting camera surveys, operating the slugging rod during slug testing, setting and removing pumps, and providing certain equipment required during testing (such as pump generators, outdoor lighting, discharge pipe, etc.). EFS will also supply a job safety analysis for each of the sites.

Environmental Protection will determine the potential impact to endangered, threatened, or sensitive plant and animal species where groundwater will be disposed to the ground. A letter of approval will be provided for those areas where the groundwater is discharged directly to the ground.

## 9.0 HEALTH AND SAFETY

A job safety analysis (JSA) will be supplied for the test sites. The level of protection required by the JSA will depend on whether the groundwater is contaminated, or designated as clean.

## 10.0 REFERENCES

DOE-RL, 1992a, *Hanford Past Practice Investigation Strategy*, DOE/RL-91-40, Draft A, U.S. Department of Energy, Richland Field Office, Richland, Washington.

DOE-RL, 1992b, *200 West Groundwater Aggregate Area Management Study Report*, Decisional Draft, DOE/RL-92-16, U.S. Department of Energy, Richland Field Office, Richland, Washington.

Ecology, EPA and DOE/RL, 1991, *Hanford Federal Facility Agreement and Consent Order Change Package*, Washington State Department of Ecology, Olympia, Washington, U.S. Environmental Protection Agency, Region X, Seattle, Washington, and U.S. Department of Energy, Richland Field Office, Richland, Washington.

Graham, M. J., G. V. Last, S. R. Strait, and W. R. Brown, 1981, *Hydrology of the Separations Area*, RHO-ST-42, Rockwell Hanford Operations, Richland, Washington.

Lindsey, K. A., B. N. Bjornstad, and M. P. Connelly, 1991, *Geologic Setting of the 200 West Area: An Update*: WHC-SD-EN-TI-008, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Papadopulos, I. S., and H. H. Cooper, Jr., 1967, "Drawdown in a Well of Large Diameter," *Water Resour. Res.*, Vol. 3, no. 1, pp. 241-244.

Washington Department of Ecology, 1990, *Minimum Standards for Construction and Maintenance of Wells*: Chapter 173-160 WAC, Lacey, Washington.

Weekes, E. P., 1977, *Aquifer Tests - The State of the Art in Hydrology*: Proceedings of the Invitational Well-Symposium Proceedings, Oct. 19-21, 1977, LBL-7027, University of California, Berkeley, California.

WHC, 1988a, *Environmental Investigations and Site Characterization Manual*, WHC-CM-7-7, Vol. 1, Westinghouse Hanford Company, Richland, Washington.

WHC, 1988b, *Quality Assurance Manual*, WHC-CM-4-2, Westinghouse Hanford Company, Richland Washington.

WHC, 1990, *Environmental Engineering, Technology, and Permitting Function Quality Assurance Program Plan*, WHC-EP-0383, Westinghouse Hanford Company, Richland, Washington.

WHC, 1992, *Hydrogeologic Model for the 200 West Groundwater Aggregate Area*: WHC-SD-EN-TI-014, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

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# APPENDIX

## WELL CONSTRUCTION AND COMPLETION SUMMARIES

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## WELL CONSTRUCTION AND COMPLETION SUMMARY

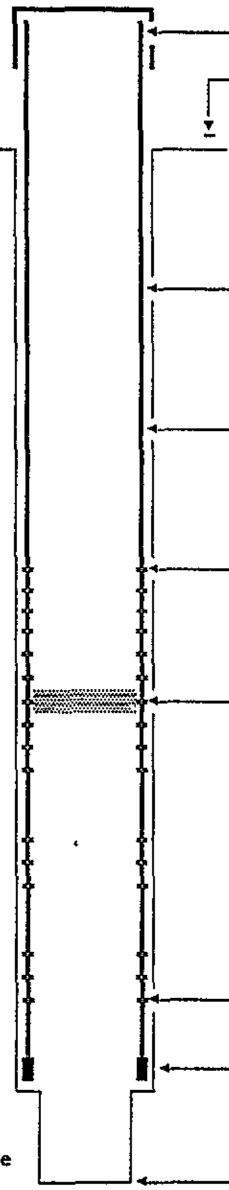
| | | |
|---|---|---|
| Drilling Method: Cable tool | Sample Method: Drive barrel Hard tool | WELL NUMBER: 299-W19-4 TEMPORARY WELL NO: 299-W-39-72 |
| Drilling Fluid Used: Water | Additives Used: Not documented | Hanford Coordinates: N/S N 39,000 E/W W 71,999 |
| Driller's Name: Close/Gage | WA State Lic Nr: Not documented | State Coordinates: N 444,000 E 2,223,000 |
| Drilling Company: Bach Drilling Co | Company Location: Yakima, WA | Start Card #: Not documented T___ R___ S___ |
| Date Started: 01Dec59 | Date Complete: 15Feb60 | Elevation Ground surface (ft): 714.0 Estimated |

Depth to water: 270-ft Feb60
(Ground surface) 255.2-ft Dec91

GENERALIZED STRATIGRAPHY    Driller's Log

0-4: SAND
4-15: GRAVEL
15-30: GRAVEL boulders
30-45: SAND & GRAVEL
45-75: GRAVEL & SAND
75-105: SAND
105-115: Hard SAND with hard fine SILT
115-169: SILT & SAND
169-200: Yellow CLAY
200-215: CLAY with small GRAVEL
215-220: CLAY
220-225: Brown CLAY
225-230: CLAY
230-240: CLAY & GRAVEL
240-262: CLAY
262-295: GRAVEL & CLAY
295-300: GRAVEL
300-305: GRAVEL & CLAY
305-315: GRAVEL & SAND
315-335: SAND, GRAVEL & CLAY
335-345: BOULDERS, GRAVEL
345-350: BOULDERS, SAND & CLAY (Cemented gravel)
350-365: BOULDERS, GRAVEL, SAND
365-385: BOULDERS, GRAVEL
385-443: GRAVEL, SAND & CLAY
443-451: CLAY
451-455: SAND & CLAY
455-470: GRAVEL, SAND & CLAY
470-490: GRAVEL, basalt BOULDERS
490-495: BOULDERS, GRAVEL & SAND
495-505: Cement GRAVEL
505-525: CLAY to sandy CLAY
525-535: Sandy GRAVEL
535-539: SAND
539-545: SAND & BASALT
545-550: BASALT

REMEDIATION:
Jun64, by Vincent
Perforated 465-485 and 520-535-ft
Installed three piezometer tubes to 410, 480 and 540-ft and gravel pack.
Tubes were later removed. Details/date were not documented.



Elevation of reference point: [715.26-ft] (top of casing)
Height of reference point above ground surface [1.3-ft]
Depth of surface seal [ND]
Type of surface seal: None documented
I.D. of riser pipe: [8-in]
Type of riser pipe: Carbon steel
Diameter of borehole: [9-in nom]
Depth top of perforations: [255-ft]
255-443-ft, 2 cuts/rd/ft
465-485 and 520-535-ft ND
Probable cement plug at 350-ft
Installation not documented
Depth bottom of perforations: [535-ft]
Depth bottom of casing: [539-ft]
Depth bottom of borehole: [550-ft]

Drawing By: RKL/2W19-04.AS8    Date: 19Jun92

Reference: HANFORD WELLS

## SUMMARY OF CONSTRUCTION DATA AND FIELD OBSERVATIONS
## RESOURCE PROTECTION WELL - 299-W19-4

| | | |
|---|---|---|
| WELL DESIGNATION | : | 2-W19-4 |
| CERCLA UNIT | : | 200 Aggregate Area Management Study |
| RCRA FACILITY | : | Not applicable |
| HANFORD COORDINATES | : | N 39,000 W 71,999 |
| LAMBERT COORDINATES | : | N 444,000 E 2,223,000 |
| DATE DRILLED | : | Feb60 |
| DEPTH DRILLED (GS) | : | 550-ft |
| MEASURED DEPTH (GS) | : | Not documented |
| DEPTH TO WATER (GS) | : | 270-ft Feb60; |
| | : | 255.2-ft, Dec91 |
| CASING DIAMETER | : | 8-in, +1.3↔539-ft |
| ELEV TOP CASING | : | 715.26-ft |
| ELEV GROUND SURFACE | : | 714.0-ft, Estimated |
| PERFORATED INTERVAL | : | 255↔443 and 465↔485-ft |
| SCREENED INTERVAL | : | Not applicable |
| COMMENTS | : | FIELD INSPECTION, 09May91,<br>8-in carbon steel casing.<br>No pad, No posts, capped and locked.<br>Identification stamped on brass cap.<br>Not in radiation zone.<br>OTHER: Well formerly contained five 1½-in piezometers, 299W-19-40,P,Q,R and S. All were removed, date not documented. Well apparently now has a cement plug at ~350-ft. |
| AVAILABLE LOGS | : | Driller |
| TV SCAN COMMENTS | : | Not applicable |
| DATE EVALUATED | : | Not applicable |
| EVAL RECOMMENDATION | : | Not applicable |
| LISTED USE | : | Separations area water level measurement, 15Jan64↔01Dec91<br>Not on water sample schedule |
| PUMP TYPE | : | None documented |
| MAINTENANCE | : | |

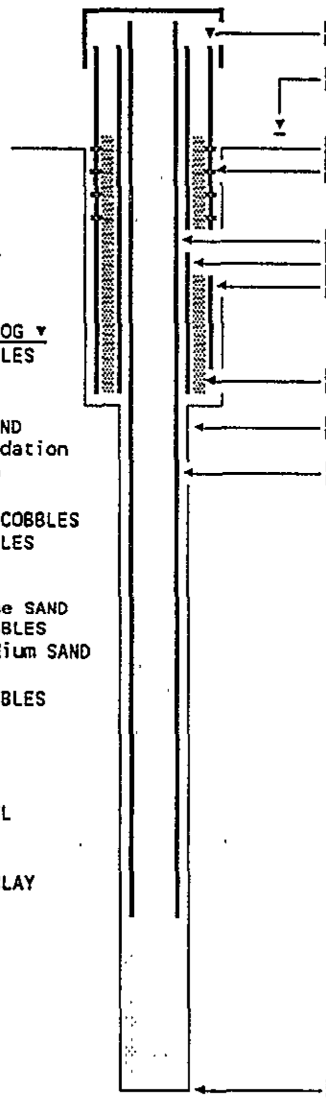
## WELL CONSTRUCTION AND COMPLETION SUMMARY

| | | |
|---|---|---|
| Drilling Method: Cable tool/rotary core | Sample Method: Hard tool/core | WELL NUMBER: 299-W14-8A — TEMPORARY WELL NO: DH-13A Core hole |
| Drilling Fluid Used: Water/Drill mud | Additives Used: Bentonite | Hanford Coordinates: N/S N 40,105 E/W W 71,788 |
| Driller's Name: Baker/Hendrickson | WA State Lic Nr: Not documented | State Coordinates: N 449,222.50 E 2,223,434.22 |
| Drilling Company: Hatch/Boyles Bros | Company Location: Pasco/Spokane | Start Card #: Not documented T____ R____ S____ |
| Date Started: Cable tool/Core 17Nov76/20Dec76 | Date Complete: Cable tool/Core 02Dec76/09Feb77 | Elevation Ground surface (ft): 721.3 Estimated |

Depth to water: ND
(Ground surface)

GENERALIZED STRATIGRAPHY — Driller's Log 0↔196-ft

0↔5: SAND
5↔20: Gravelly SAND
20↔45: GRAVEL & SAND
45↔90: Gravelly SAND
90↔168: SAND, SILT lenses 155↔157 and 160↔168-ft
168↔178: SILT
178↔196: Ringold ▼ GEOLOGIST'S LOG ▼
196↔228: GRAVEL, COBBLES and PEBBLES
228↔238: PEBBLES, COBBLES, SAND
238↔242: No recovery
242↔262: GRAVEL, COBBLES, some SAND
262↔280: SAND, some $CaCO_3$ and oxidation
280↔339: SAND to gravelly SAND to sandy GRAVEL
339↔344: Medium to large GRAVEL, COBBLES
344↔351: Fine-medium GRAVEL, COBBLES
351↔357: SAND, GRAVEL, COBBLES
357↔372: Medium-large GRAVEL
372↔382: Large GRAVEL, medium-fine SAND
382↔408: Medium-large GRAVEL, COBBLES
408↔413: Medium-large GRAVEL, medium SAND
413↔418: CLAY stringer
418↔436: Medium-large GRAVEL, PEBBLES coarse-medium SAND
436↔447: Sandy GRAVEL
447↔456: Fine-medium GRAVEL
456↔465: Sandy GRAVEL
465↔532: Medium-large sandy GRAVEL
532↔536: Basalt COBBLES, 20-in SAND stringer
536↔546: Vesicular BASALT, some CLAY
546↔563: BASALT



Elevation of reference point: [723.48-ft]
(top of 6-in casing)
Height of reference point above ground surface [2.2-ft]
Depth of surface seal [20-ft]
Perforated 0↔20-ft, 4 cuts/rd/ft
NX 3 1/2-in carbon steel casing to 473-ft
4-in carbon steel casing to 196-ft
6-in carbon steel casing to 196-ft
Cement grout
Diameter of borehole: [3 3/4-in]
Type of filler: Viscous drilling mud
Depth bottom of borehole: [563-ft]

Drawing By: RKL/2W14-08A.ASB Date: 19Jun92

Reference: HANFORD WELLS

## SUMMARY OF CONSTRUCTION DATA AND FIELD OBSERVATIONS
## RESOURCE PROTECTION WELL - 299-W14-8A

| | | |
|---|---|---|
| WELL DESIGNATION | : | 299-W14-8A |
| CERCLA UNIT | : | 200 Aggregate Area Management Study |
| RCRA FACILITY | : | Not applicable |
| HANFORD COORDINATES | : | N 40,105 W 71,788 |
| LAMBERT COORDINATES | : | N 449,222 E 2,223,434 |
| DATE DRILLED | : | Feb77 |
| DEPTH DRILLED (GS) | : | 563-ft |
| MEASURED DEPTH (GS) | : | Not documented |
| DEPTH TO WATER (GS) | : | Not documented |
| CASING DIAMETER | : | 6-in carbon steel, ~+1.0↔196-ft;<br>4-in carbon steel, ~+1↔196-ft;<br>3½-in carbon steel, ~+1↔473-ft |
| ELEV TOP CASING | : | 723.48-ft |
| ELEV GROUND SURFACE | : | 721.3-ft, Estimated |
| PERFORATED INTERVAL | : | 0↔20-ft |
| SCREENED INTERVAL | : | Not applicable |
| COMMENTS | : | FIELD INSPECTION, 22Apr91,<br>6, 4 and 3½-in carbon steel casings.<br>No pad, No posts, not capped, not locked.<br>1½-in PVC pipe stuck in hole.<br>No permanent identification.<br>OTHER: Completed as DH-13A corehole. |
| AVAILABLE LOGS | : | Driller/Geologist |
| TV SCAN COMMENTS | : | Not applicable |
| DATE EVALUATED | : | Not applicable |
| EVAL RECOMMENDATION | : | Not applicable |
| LISTED USE | : | No water level data<br>Not on water sample schedule |
| PUMP TYPE | : | None documented |
| MAINTENANCE | : | |

## WELL CONSTRUCTION AND COMPLETION SUMMARY

Drilling Method: Cable tool
Drilling Fluid Used: Water
Driller's Name: Bultena/Graham
Drilling Company: Hatch Drilling Co.
Date Started: 27May81 Redrill 23Jun81

Sample Drive barrel Method: Hard tool
Additives Used: Not documented
WA State Lic Nr: Not documented
Company Location: Pasco, WA
Date Complete: 31Jul81

WELL NUMBER: 299-W14-10
TEMPORARY WELL NO: ______
Hanford Coordinates: N/S N 40,810 E/W W 71,905
State Coordinates: N 445,927 E 2,223,315
Start Card #: Not documented T___ R___ S___
Elevation Ground surface (ft): Not documented

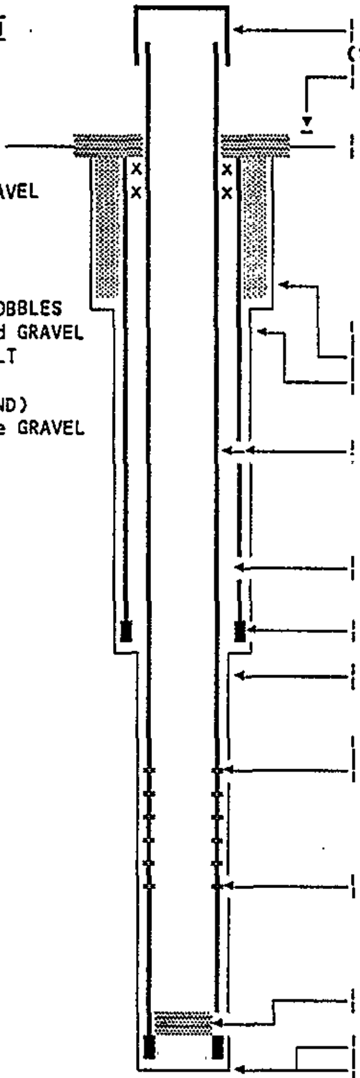
Depth to water: 265-ft Apr85
(Ground surface) 263.5-ft Apr91

GENERALIZED STRATIGRAPHY

Driller's Log for Redrilled hole

0↔45: COBBLES and SAND
45↔57: SAND w/small amounts GRAVEL
57↔146: Brown & black SAND, lenses of SILT
146↔159: Brown SAND and SILT
159↔230: Compacted GRAVEL
230↔270: Cemented GRAVEL and COBBLES (Ringold) consolidated GRAVEL
270↔285: SILT & SAND-SAND & SILT
285↔295: Loose heaving SAND
295↔324: SAND SILT (heaving SAND)
324↔328: SAND-SILT mixed coarse GRAVEL
328↔330: 90% fine SAND, 10% small GRAVEL

PERFORATIONS:
28Dec81, by McGhan
Explosive perforation
by shaped charge detonation



Elevation of reference point: (top of casing) [ ND ]
Height of reference point above ground surface [ 2.2-ft ]
Depth of surface seal [ 20-ft ]
Type of surface seal: Bentonite inside 12-in casing
I.D. of surface casing (Pulled during installation of surface seal) [ 12-in ]
Borehole diameter: 0↔20-ft, 13-in nominal; 20↔270-ft, 11-in nominal
I.D. of riser pipe: 10 & 8-in carbon steel
Type of filler: Metal seal, location not documented
10-in casing to ~242-ft
Borehole diameter: 270↔330-ft, 9-in nominal
Depth top of perforations: [ 260-ft ]
Description of perforations: 260↔275-ft, 46 shaped charges 22.7 gram charges
Depth bottom of perforations: [ 275-ft ]
Cement plug, 325↔327-ft
Depth bottom of 8-in casing
Depth bottom of borehole: [ 330-ft ]

Drawing By: RKL/2W14-10.ASB Date: 19Jun92

Reference: HANFORD WELLS

## SUMMARY OF CONSTRUCTION DATA AND FIELD OBSERVATIONS
## RESOURCE PROTECTION WELL - 299-W14-10

| | | |
|---|---|---|
| WELL DESIGNATION | : | 299-W14-10 |
| CERCLA UNIT | : | 200 Aggregate Area Management Study |
| RCRA FACILITY | : | Not applicable |
| HANFORD COORDINATES | : | N 40,810 W 71,905 |
| LAMBERT COORDINATES | : | N 445,927 E 2,223,315 |
| DATE DRILLED | : | Jul81 |
| DEPTH DRILLED (GS) | : | 330-ft |
| MEASURED DEPTH (GS) | : | 315.5-ft, Apr91 |
| DEPTH TO WATER (GS) | : | 265-ft, Aug85;<br>263.5-ft, Apr91 |
| CASING DIAMETER | : | 10-in carbon steel, 0↔242-ft;<br>8-in carbon steel, +2.9↔330-ft |
| ELEV TOP CASING | : | Not documented |
| ELEV GROUND SURFACE | : | Not documented |
| PERFORATED INTERVAL | : | 260↔275-ft |
| SCREENED INTERVAL | : | Not applicable |
| COMMENTS | : | FIELD INSPECTION, 09May91,<br>8-in carbon steel casing.<br>2-ft cement pad, No posts, capped and locked.<br>Well identification stamped on brass cap in pad.<br>Not in radiation zone.<br>OTHER: Perforation done by explosive shaped charges. |
| AVAILABLE LOGS | : | Driller |
| TV SCAN COMMENTS | : | Not applicable |
| DATE EVALUATED | : | Not applicable |
| EVAL RECOMMENDATION | : | Not applicable |
| LISTED USE | : | Water levels measured, 08Mar82↔12Apr90<br>PNL Semiannual, WHC Quarterly water sample schedule |
| PUMP TYPE | : | Electric submersible |
| MAINTENANCE | : | |

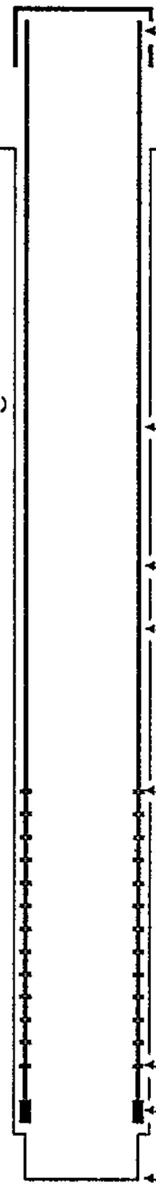
## WELL CONSTRUCTION AND COMPLETION SUMMARY

| | | |
|---|---|---|
| Drilling Method: Cable tool | Sample Method: Hard tool nom | WELL NUMBER: 299-W11-10 — TEMPORARY WELL NO: 361-T-24 |
| Drilling Fluid Used: Water | Additives Used: Not documented | Hanford Coordinates: N/S N 43,150 — E/W W 71,500 |
| Driller's Name: Chausse | WA State Lic Nr: Not documented | State Coordinates: N 448,268 — E 2,223,714 |
| Drilling Company: Not documented | Company Location: Not documented | Start Card #: Not documented — T____ R____ S______ |
| Date Started: 20Mar56 | Date Complete: 16Apr56 | Elevation Ground surface (ft): 726.8 Estimated |

Depth to water: 279-ft Apr56
(Ground surface) 270.6-ft Dec91

GENERALIZED STRATIGRAPHY — Driller's Log

0↔3: TOPSOIL
3↔8: GRAVEL
8↔16: COBBLES-GRAVEL
16↔27: COBBLES, SAND, GRAVEL
27↔42: SAND, GRAVEL, COBBLES
42↔62: Not documented
62↔75: SAND, SILT, GRAVEL
75↔141: SAND-SILT
141↔165: GRAVEL, SAND and SILT
165↔177: SAND and SILT
177↔195: GRAVEL(Added bentonite @185-ft)
195↔307: SAND, SILT and GRAVEL



Elevation of reference point: (top of casing) [728.89-ft]
Height of reference point above ground surface [2.1-ft ]
Depth of surface seal [ND ]
Type of surface seal: None documented
I.D. of surface casing (None documented) [ND ]
I.D. of riser pipe: [8-in ]
Type of riser pipe: Carbon steel
Diameter of borehole: [9-in nom]
Type of filler: Not documented
Elevation/depth top of seal
Type of seal: Not documented
Depth top of perforations: [256-ft ]
Description of perforations: Not documented
Depth bottom of perforations: [304-ft ]
Depth bottom of casing: [~305.0-ft]
Depth bottom of borehole [307-ft ]

Drawing By: RKL/2W11-10.ASB Date: 19Jun92

Reference: HANFORD WELLS

# SUMMARY OF CONSTRUCTION DATA AND FIELD OBSERVATIONS
# RESOURCE PROTECTION WELL - 299-W11-10

| | | |
|---|---|---|
| WELL DESIGNATION | : | 299-W11-10 |
| CERCLA UNIT | : | 200 Aggregate Area Management Study |
| RCRA FACILITY | : | Not applicable |
| HANFORD COORDINATES | : | N 43,150 W 71,500 |
| LAMBERT COORDINATES | : | N 448,268 E 2,223,714 |
| DATE DRILLED | : | Apr56 |
| DEPTH DRILLED (GS) | : | 307-ft |
| MEASURED DEPTH (GS) | : | Not documented |
| DEPTH TO WATER (GS) | : | 279-ft, Apr56;<br>270.6-ft, Dec91 |
| CASING DIAMETER | : | 8-in carbon steel, +2.1↔305.0-ft; |
| ELEV TOP CASING | : | 728.89-ft |
| ELEV GROUND SURFACE | : | 726.8-ft, Estimated |
| PERFORATED INTERVAL | : | 8-in casing, 256↔304-ft |
| SCREENED INTERVAL | : | Not applicable |
| COMMENTS | : | FIELD INSPECTION, 21May91,<br>8-in carbon steel casing.<br>No pad, No posts, capped and locked.<br>No permanent identification.<br>Not in radiation zone.<br>OTHER: |
| AVAILABLE LOGS | : | Driller |
| TV SCAN COMMENTS | : | Not applicable |
| DATE EVALUATED | : | Not applicable |
| EVAL RECOMMENDATION | : | Not applicable |
| LISTED USE | : | Separations area Semiannual water level measurement, 18Apr56↔01Dec91<br>Not on water sample schedule |
| PUMP TYPE | : | None documented |
| MAINTENANCE | : | |

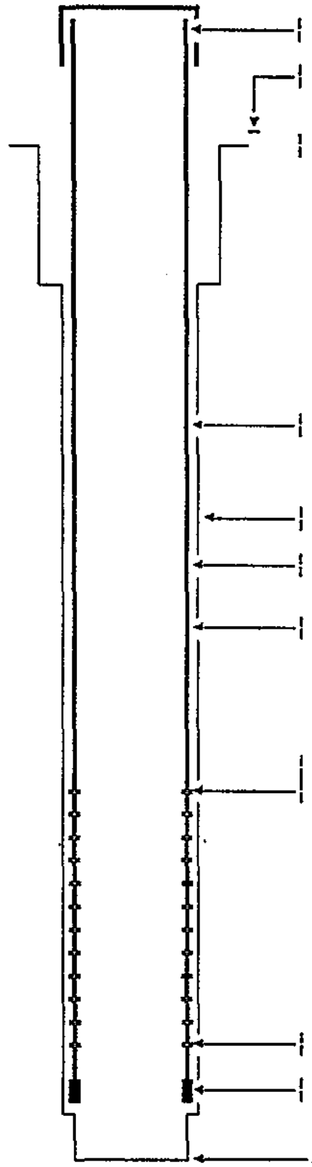
## WELL CONSTRUCTION AND COMPLETION SUMMARY

| | | |
|---|---|---|
| Drilling Method: Cable tool | Sample Method: Hard tool nom | WELL NUMBER: 299-W12-1    TEMPORARY WELL NO: 361-T-25 |
| Drilling Fluid Used: Water | Additives Used: Not documented | Hanford Coordinates: N/S N 45,083   E/W W 70,733 |
| Driller's Name: Chausse | WA State Lic Nr: Not documented | State Coordinates: N 450,203   E 2,224,476 |
| Drilling Company: Not documented | Company Location: Not documented | Start Card #: Not documented   T____ R____ S______ |
| Date Started: 17Apr56 | Date Complete: 09May56 | Elevation Ground surface (ft): 724.2 Estimated |

Depth to water: 288-ft May56
(Ground surface) 273.1-ft Dec91

GENERALIZED STRATIGRAPHY    Driller's Log

0→10: TOPSOIL-GRAVEL
10→21: SAND-COBBLES
21→72: Not documented
72→110: Pea GRAVEL-SAND-SILT
110→127: Not documented
127→136: GRAVEL, SAND, SILT
144,148: SAND
148→175: Not documented
175→178: SAND-GRAVEL
179,187: BOULDERS, SAND and GRAVEL
187→200: Not documented
200→230: Cemented GRAVEL
230→297: Not documented
297→314 SAND, SILT and GRAVEL



Elevation of reference point: [726.46-ft]
(top of casing)
Height of reference point above ground surface [2.26-ft]
Depth of surface seal [ND]
Type of surface seal: None documented
I.D. of surface casing [10-in nom]
(Assumed pulled)
I.D. of riser pipe: [8-in]
Type of riser pipe: Carbon steel
Diameter of borehole: [9-in nom]
Type of filler: Not documented
Elevation/depth top of seal
Type of seal: Not documented
Depth top of perforations: [274-ft]
Description of perforations: Not documented
Depth bottom of perforations: [309-ft]
Depth bottom of casing: [~310-ft]
Depth bottom of borehole: [314-ft]

Drawing By: RKL/2W12-01.ASB    Date: 19Jun92
Reference: HANFORD WELLS

SUMMARY OF CONSTRUCTION DATA AND FIELD OBSERVATIONS
RESOURCE PROTECTION WELL - 299-W12-1

| | | |
|---|---|---|
| WELL DESIGNATION | : | 299-W12-1 |
| CERCLA UNIT | : | 200 Aggregate Area Management Study |
| RCRA FACILITY | : | Not applicable |
| HANFORD COORDINATES | : | N 45,083 W 70,733 |
| LAMBERT COORDINATES | : | N 450,203 E 2,224,476 |
| DATE DRILLED | : | May56 |
| DEPTH DRILLED (GS) | : | 314-ft |
| MEASURED DEPTH (GS) | : | Not documented |
| DEPTH TO WATER (GS) | : | 288-ft, May56 |
| | : | 273.1-ft, 01Dec91 |
| CASING DIAMETER | : | 8-in carbon steel, +2.3-~310-ft; |
| ELEV TOP CASING | : | 726.46-ft |
| ELEV GROUND SURFACE | : | 724.2-ft Estimated |
| PERFORATED INTERVAL | : | 8-in casing, 274-309-ft |
| SCREENED INTERVAL | : | Not applicable |
| COMMENTS | : | FIELD INSPECTION, 22Apr91,<br>8-in carbon steel casing.<br>No pad, No posts, capped, not locked.<br>No permanent identification.<br>Not in radiation zone.<br>OTHER: |
| AVAILABLE LOGS | : | Driller |
| TV SCAN COMMENTS | : | Not applicable |
| DATE EVALUATED | : | Not applicable |
| EVAL RECOMMENDATION | : | Not applicable |
| LISTED USE | : | Separations area water level measurement, 21May56-01Dec91<br>PNL Annual water sample schedule |
| PUMP TYPE | : | None documented |
| MAINTENANCE | : | |

## WELL CONSTRUCTION AND COMPLETION SUMMARY

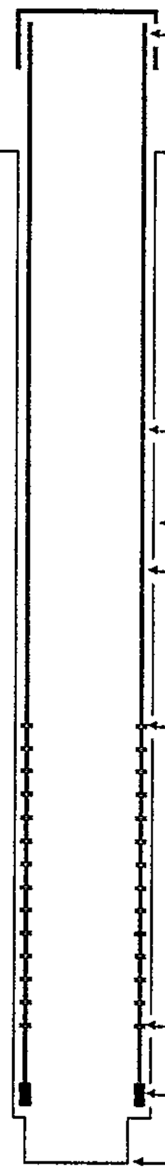
| | | |
|---|---|---|
| Drilling Method: Cable tool | Sample Method: Hard tool (nom) | WELL NUMBER: 299-W11-8    TEMPORARY WELL NO: 361-T-22 |
| Drilling Fluid Used: Not documented | Additives Used: Not documented | Hanford Coordinates: N/S N 42,759   E/W W 72,992 |
| Driller's Name: Gentz | WA State Lic Nr: Not documented | State Coordinates: N 447,873   E 2,222,223 |
| Drilling Company: Not documented | Company Location: Not documented | Start Card #: Not documented   T____ R____ S______ |
| Date Started: 02Nov53 | Date Complete: 01Dec53 | Elevation Ground surface (ft): Not documented |

Depth to water: 289-ft Nov53
(Ground surface) 260-ft Jan65

GENERALIZED STRATIGRAPHY    Driller's Log

0–12: Fine SAND
12–22: Coarse GRAVEL
22–34: Coarse GRAVEL and BOULDERS<8-in
34–42: 80% coarse–small GRAVEL, 20% fine gray SAND
42–50: Fine gray SAND, little SILT
50–65: 50%fine gray-50%coarse SAND
65–70: Fine & coarse SAND, little SILT
70–75: SAND and SILT
75–100: Fine brown SAND, little SILT
100–145: SAND and SILT
145–154: SAND, SILT and CALICHE
154–160: 75%coarse gray SAND, 50%small–coarse GRAVEL <2-in
160–173: 25%fine SAND, 75% small&coarse GRAVEL <3-in
173–178: Fine SAND
178–195: 90%coarse GRAVEL, 10%fine SAND
195–210: Coarse GRAVEL up to 5-in
210–215: 25%pea, 75%coarse GRAVEL
215–225: Coarse GRAVEL and COBBLES
225–232: 40%coarse SAND, 40%pea, 20%coarse GRAVEL
232–265: Small GRAVEL, SAND and SILT
265–285: 50%small and coarse GRAVEL 50%fine SAND and SILT
285–300: Coarse GRAVEL, BOULDERS, SAND and SILT
300–310: Small and coarse GRAVEL and fine SAND
310–315; Coarse GRAVEL, BOULDERS and fine SAND

REMEDIATION:
Aug56, by Wall-Richards
Perforated 260–270-ft



Elevation of reference point: (top of casing) [719.18-ft]
Height of reference point above ground surface [ND]
Depth of surface seal [ND]
Type of surface seal: None documented
I.D. of surface casing (If present) [ND]
I.D. of riser pipe: [8-in]
Type of riser pipe: Carbon steel
Diameter of borehole: [9-in nom]
Type of filler: Not documented
Depth top of perforations: [260-ft]
Description of perforations: 260–270-ft, 6 holes/ft; 270–310-ft, not documented
Depth bottom of perforations: [310-ft]
Depth bottom of casing: [313.8-ft]
Depth bottom of borehole: [315-ft]

Drawing By: RKL/2W11-08.ASB    Date: 19Jun92

Reference: HANFORD WELLS

# SUMMARY OF CONSTRUCTION DATA AND FIELD OBSERVATIONS
## RESOURCE PROTECTION WELL - 299-W11-8

| | | |
|---|---|---|
| WELL DESIGNATION | : | 299-W11-8 |
| CERCLA UNIT | : | 200 Aggregate Area Management Study |
| RCRA FACILITY | : | |
| HANFORD COORDINATES | : | N 42,759 W 72,992 |
| LAMBERT COORDINATES | : | N 447,873 E 2,222,223 |
| DATE DRILLED | : | Dec53 |
| DEPTH DRILLED (GS) | : | 315-ft |
| MEASURED DEPTH (GS) | : | Not documented |
| DEPTH TO WATER (GS) | : | 289-ft, Sep56;<br>~260-ft, Jan65 |
| CASING DIAMETER | : | 8-in carbon steel, +ND↔~314-ft; |
| ELEV TOP CASING | : | 719.18-ft |
| ELEV GROUND SURFACE | : | Not documented |
| PERFORATED INTERVAL | : | 8-in casing, 260↔310-ft |
| SCREENED INTERVAL | : | Not applicable |
| COMMENTS | : | FIELD INSPECTION,<br>OTHER: |
| AVAILABLE LOGS | : | Driller |
| TV SCAN COMMENTS | : | Not applicable |
| DATE EVALUATED | : | Not applicable |
| EVAL RECOMMENDATION | : | Not applicable |
| LISTED USE | : | Water levels measured, 21Jan54↔19Jan65;<br>Not on water sample schedule |
| PUMP TYPE | : | None documented |
| MAINTENANCE | : | |

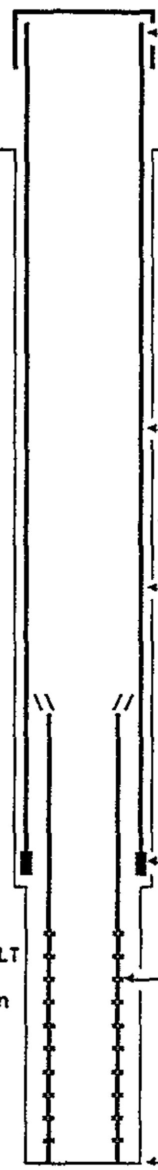
## WELL CONSTRUCTION AND COMPLETION SUMMARY

| | | |
|---|---|---|
| Drilling Method: Cable tool | Sample Method: Hard tool (nom) | WELL NUMBER: 299-W11-9 TEMPORARY WELL NO: 361-T-23 |
| Drilling Fluid Used: Not documented | Additives Used: Bentonite | Hanford Coordinates: N/S N 43,319 E/W W 72,542 |
| Driller's Name: Gentz | WA State Lic Nr: Not documented | State Coordinates: N 448,435 E 2,222,672 |
| Drilling Company: Not documented | Company Location: Not documented | Start Card #: Not documented T___ R___ S___ |
| Date Started: 05Feb54 | Date Complete: 26Apr54 | Elevation Ground surface (ft): 721.0 Estimated |

Depth to water: 285-ft Apr54
(Ground surface) 262.8-ft Dec91

GENERALIZED STRATIGRAPHY — Driller's Log

0↔10: COBBLES, coarse GRAVEL and SILT
10↔25: BOULDERS, GRAVEL and SAND
25↔30: Coarse GRAVEL and SAND
30↔35: BOULDERS, GRAVEL, little SAND
35↔40: BASALT, COBBLES, little SAND
40↔48: COBBLES, GRAVEL, SAND
48↔62: Coarse SAND and SILT
62↔85: Small and coarse GRAVEL, SAND and SILT
85↔90: Coarse and fine SAND
90↔100: SAND, little SILT
100↔110: Coarse and fine SAND
110↔115: SAND, little SILT
115↔135: SAND, SILT, CLAY
135↔140: SAND, SILT, CALICHE
140↔146: SAND, little SILT
146↔160: Small and coarse GRAVEL & SAND
160↔165: COBBLES, GRAVEL and SAND
165↔180: Coarse SAND and GRAVEL
180↔185: COBBLES and coarse GRAVEL
185↔210: Coarse GRAVEL and SAND
210↔220: COBBLES, coarse GRAVEL & SAND
220↔235: Coarse GRAVEL, SAND, little SILT
235↔245: Coarse GRAVEL, fine SAND
245↔250: Coarse GRAVEL, SAND & SILT
250↔255: Coarse GRAVEL and SAND
255↔262: Coarse GRAVEL, SAND & SILT
262↔270: RIND STONE, coarse GRAVEL, SAND, little SILT
270↔275: Small and coarse GRAVEL, SAND, little SILT
275↔280: GRAVEL, SAND and SILT
280↔285: SAND, SILT, little GRAVEL
285↔290: Coarse GRAVEL, SAND, little SILT
290↔292: SAND, SILT and coarse GRAVEL
292↔297: Small and coarse GRAVEL to 4-in
(Drilling with bentonite @ 293-ft)



Elevation of reference point: (top of casing) [722.94-ft]
Height of reference point above ground surface [2.0-ft]
Depth of surface seal [ND]
Type of surface seal: None documented
I.D. of surface casing (If present) [ND]
I.D. of riser pipe: [8-in]
Type of riser pipe: Carbon steel
Diameter of borehole: [9-in nom]
Type of filler: Not documented
8-in casing to 270-ft
6-in liner 253.5↔297-ft
Top of liner flared to 8-in casing
Perforated 275↔297-ft, 4 holes/ft
Depth bottom of borehole: [297-ft]

Drawing By: RKL/2W11-09.ASB Date: 19Jun92

Reference: HANFORD WELLS

SUMMARY OF CONSTRUCTION DATA AND FIELD OBSERVATIONS
RESOURCE PROTECTION WELL - 299-W11-9

| | | |
|---|---|---|
| WELL DESIGNATION | : | 299-W11-9 |
| CERCLA UNIT | : | 200 Aggregate Area Management Study |
| RCRA FACILITY | : | |
| HANFORD COORDINATES | : | N 43,319 W 72,542 |
| LAMBERT COORDINATES | : | N 448,435 E 2,222,672 |
| DATE DRILLED | : | Apr54 |
| DEPTH DRILLED (GS) | : | 297-ft |
| MEASURED DEPTH (GS) | : | Not documented |
| DEPTH TO WATER (GS) | : | 285-ft, Apr54;<br>262.8-ft, 01Dec91 |
| CASING DIAMETER | : | 8-in carbon steel, +2.0↔270-ft;<br>6-in carbon steel liner, 253.5↔297-ft |
| ELEV TOP CASING | : | 722.94-ft |
| ELEV GROUND SURFACE | : | Not documented |
| PERFORATED INTERVAL | : | 6-in liner, 275↔297-ft |
| SCREENED INTERVAL | : | Not applicable |
| COMMENTS | : | FIELD INSPECTION, 21May91,<br>8-in carbon steel casing.<br>No pad, No posts, capped and locked.<br>No permanent identification.<br>Not in radiation zone.<br>OTHER: |
| AVAILABLE LOGS | : | Driller |
| TV SCAN COMMENTS | : | Not applicable |
| DATE EVALUATED | : | Not applicable |
| EVAL RECOMMENDATION | : | Not applicable |
| LISTED USE | : | Separations area Semiannual water level measurement, 17Jun54↔01Dec91;<br>PNL Annual water sample schedule |
| PUMP TYPE | : | None documented |
| MAINTENANCE | : | |

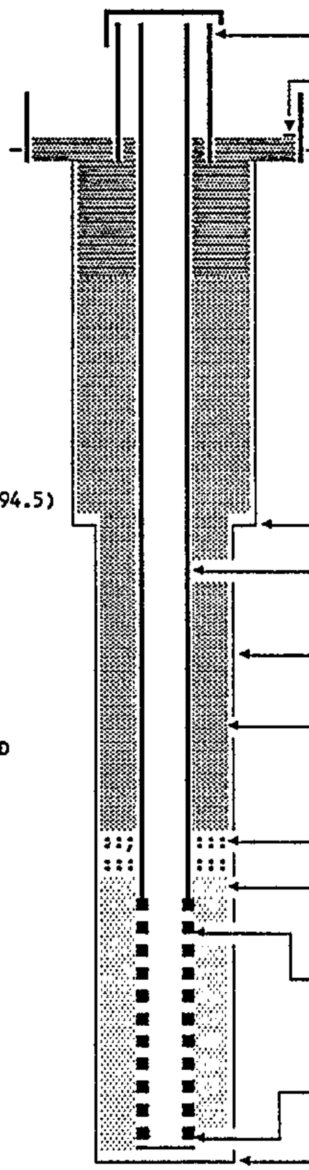
## WELL CONSTRUCTION AND COMPLETION SUMMARY

| | | |
|---|---|---|
| Drilling Method: Cable tool | Sample Method: Drive barrel Hard tool | WELL NUMBER: 299-W22-40 |
| Drilling Fluid Used: Water | Additives Used: None | TEMPORARY WELL NO: |
| Driller's Name: L. Watkins | WA State Lic Nr: Not documented | Hanford Coordinates: N/S N 36,242.3 E/W W 73,041.7 |
| Drilling Company: Kaiser Engineers Han | Company Location: Richland, WA | State NAD83 Coordinates: N 134,509.99m E 567,634.57m |
| Date Started: 01Mar90 | Date Complete: 15May90 | Start Card #: Not documented T___ R___ S___ |
| | | Elevation Ground surface (ft): 689.22 Brass cap |

Depth to water: 228.1-ft Apr90
(Ground surface) 231.8-ft Mar92

GENERALIZED STRATIGRAPHY — Geologist's Log

5: SAND
10: Slightly gravelly, slightly muddy SAND
15: Slightly muddy SAND
20: Muddy SAND
25,30: Slighlty gravelly SAND
35,40: SAND
43: Muddy SAND
45,50,55: SAND
60: Slightly gravelly SAND
64: Slightly muddy SAND
65: Gravelly SAND
70,75,80,85: SAND
87: Slightly muddy SAND
90,95: SAND (Sl muddy 92-93, 94-94.5)
100: Muddy SAND
105: SAND
110,115: Slightly muddy SAND
120↔155: SAND
160,165,170: Slightly muddy SAND
175: Muddy SAND
180: Slightly muddy SAND
185: Muddy SAND
190: Slightly gravelly, slightly muddy SAND
195: Slightly muddy gravelly SAND
200: Slightly muddy SAND
205: Slightly gravelly, slightly muddy SAND
210,215,220: Muddy SAND
225: Slightly muddy SAND
230: Muddy SAND
235,240,245: Muddy sandy GRAVEL



Elevation of reference point: (top of casing) [692.23-ft]
Height of reference point above ground surface [3.0-ft]
Depth of surface seal [20.5-ft]
Type of surface seal: Cement grout
10 3/4-in nominal hole to 143.5-ft.
I.D. of riser pipe: [4-in]
Type of riser pipe: Type 304 stainless steel
Diameter of borehole: 143.5↔245.0-ft [9-in nom]
Type of filler, 20.5↔211.1-ft: Bentonite crumbles 8↔20 mesh
Bentonite pellets, 1/2↔3/8-in 211.1↔218.1-ft
Depth top of sand pack: 40 mesh silica sand to 243.2-ft [218.1-ft]
Depth top of screen: 4-in, #10-slot, Johnson type 304 stainless steel, wire wrapped, with bottom cap and channel pack [224.1-ft]
Depth bottom of screen: [244.5-ft]
Depth bottom of borehole: [245.0-ft]

Drawing By: RKL/2W22-40.ASB Date: 19Jun92

Reference: WHC-MR-0208, October 1990
KEH Survey Data Report, 18Jun90

# SUMMARY OF CONSTRUCTION DATA AND FIELD OBSERVATIONS
# RESOURCE PROTECTION WELL - 299-W22-40

| | | |
|---|---|---|
| WELL DESIGNATION | : | 299-W22-40 |
| CERCLA UNIT | : | 200 Aggregate Area Management Study |
| RCRA FACILITY | : | 216-U-12 |
| HANFORD COORDINATES | : | N 36,242.3 W 73,041.7 |
| LAMBERT COORDINATES | : | NAD83 N 134,509.99m E 567,634.57m |
| DATE DRILLED | : | May90 |
| DEPTH DRILLED (GS) | : | 245.0-ft |
| MEASURED DEPTH (GS) | : | 244.5-ft |
| DEPTH TO WATER (GS) | : | 228.1-ft, Apr90;<br>231.8-ft, Mar92 |
| CASING DIAMETER | : | 4-in, stainless steel, +ND↔224.1-ft;<br>6-in, stainless steel, +3.0↔~0.5-ft (not documented) |
| ELEV TOP CASING | : | 692.33-ft |
| ELEV GROUND SURFACE | : | 689.22 (Brass cap) |
| PERFORATED INTERVAL | : | Not applicable |
| SCREENED INTERVAL | : | 224.1↔244.5-ft, #10-slot, stainless steel |
| COMMENTS | : | FIELD INSPECTION,<br>OTHER: |
| AVAILABLE LOGS | : | Driller |
| TV SCAN COMMENTS | : | Not applicable |
| DATE EVALUATED | : | Not applicable |
| EVAL RECOMMENDATION | : | Not applicable |
| LISTED USE | : | U-12 crib Quarterly water level measurement, 20Nov90↔11Mar92;<br>Not on water sample schedule |
| PUMP TYPE | : | Hydrostar |
| MAINTENANCE | : | |

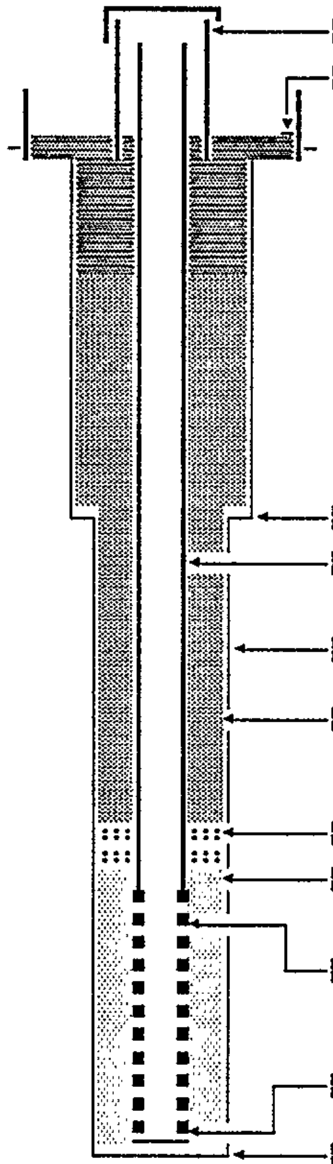
## WELL CONSTRUCTION AND COMPLETION SUMMARY

| | | |
|---|---|---|
| Drilling Method: Cable tool | Sample Method: Drive barrel Hard tool | WELL NUMBER: 299-W22-41 TEMPORARY WELL NO: |
| Drilling Fluid Used: Water | Additives Used: None | Hanford Coordinates: N/S N 36,142.1 E/W W 73,033.8 |
| Driller's Name: C. Wamsley | WA State Lic Nr: Not documented | State NAD83 Coordinates: N 134,479.46m E 567,637.04m |
| Drilling Company: Kaiser Engineers Han | Company Location: Richland, WA | Start Card #: Not documented T___ R___ S___ |
| Date Started: 07Feb90 | Date Complete: 15May90 | Elevation Ground surface (ft): 688.77 Brass cap |

Depth to water: 228.0-ft Apr90
(Ground surface) 231.2-ft Dec91

GENERALIZED STRATIGRAPHY — Geologist's Log

5: Slightly muddy SAND
10↔45: SAND
50: Slightly gravelly SAND
55↔105: SAND (slightly cemented at 104 ft)
110: Muddy SAND
115↔155: SAND
160: Muddy SAND
165↔185: Sandy MUD
190↔205: Muddy sandy GRAVEL
210↔230: Sandy MUD
235↔245: Muddy sandy GRAVEL



Elevation of reference point: (top of casing) [691.74-ft]

Height of reference point above ground surface [3.0 ft]

Depth of surface seal [18.4-ft]

Type of surface seal: Cement grout

10 3/4-in nominal hole to 132.1-ft

I.D. of riser pipe: [4-in]
Type of riser pipe: Type 304 stainless steel

Diameter of borehole: 132.1↔244.4-ft [9-in nom]

Type of filler, 18.4↔215.4-ft: Bentonite crunbles 8↔20 mesh

Bentonite pellets, 1/2↔3/8-in 215.4↔220.7-ft

Depth top of sand pack: 40↔100 mesh silica sand to 243.7-ft [220.7-ft]

Depth top of screen: 4-in, #5-slot, Johnson type 304 stainless steel, wire wrapped, with bottom cap. [224.1-ft]

Depth bottom of screen: [245.3-ft]

Depth bottom of borehole: [245.3-ft]

Drawing By: RKL/2W22-41.ASB Date: 19Jun92

Reference: WHC-MR-0208, October 1990
KEH Survey Data Report, 18Jun90

# SUMMARY OF CONSTRUCTION DATA AND FIELD OBSERVATIONS
# RESOURCE PROTECTION WELL - 299-W22-41

| | | |
|---|---|---|
| WELL DESIGNATION | : | 299-W22-41 |
| CERCLA UNIT | : | 200 Aggregate Area Management Study |
| RCRA FACILITY | : | 216-U-12 |
| HANFORD COORDINATES | : | N 36,142.1 W 73,033.8 |
| LAMBERT COORDINATES | : | NAD83 N 134,479.46m E 567,637.04m |
| DATE DRILLED | : | May90 |
| DEPTH DRILLED (GS) | : | 245.3-ft |
| MEASURED DEPTH (GS) | : | 245.3-ft |
| DEPTH TO WATER (GS) | : | 228.0-ft, Apr90;<br>231.3-ft, Mar91 |
| CASING DIAMETER | : | 4-in, stainless steel, +ND→224.1-ft;<br>6-in, stainless steel, +3.0→¯0.5-ft (not documented) |
| ELEV TOP CASING | : | 691.74-ft |
| ELEV GROUND SURFACE | : | 688.77 (Brass cap) |
| PERFORATED INTERVAL | : | Not applicable |
| SCREENED INTERVAL | : | 224.1→245.3-ft, #5-slot, stainless steel |
| COMMENTS | : | FIELD INSPECTION;<br>OTHER: |
| AVAILABLE LOGS | : | Driller |
| TV SCAN COMMENTS | : | Not applicable |
| DATE EVALUATED | : | Not applicable |
| EVAL RECOMMENDATION | : | Not applicable |
| LISTED USE | : | U-12 Crib Quarterly water level measurement, 20Nov90→11Mar91;<br>Not on water sample schedule |
| PUMP TYPE | : | Hydrostar |
| MAINTENANCE | : | |

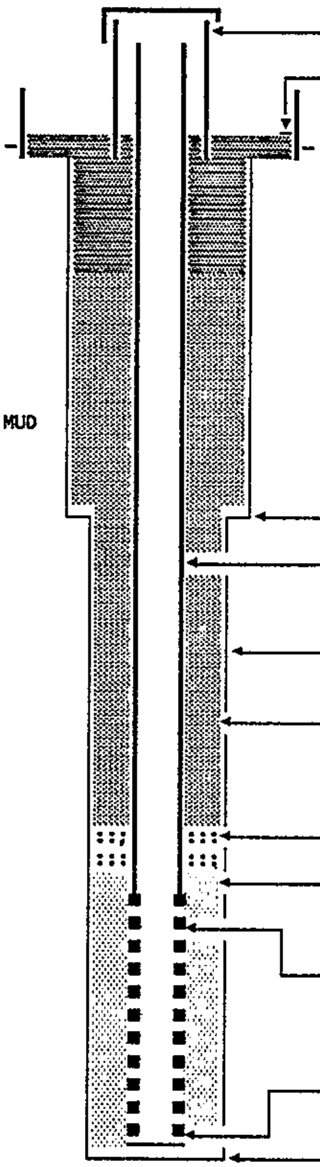
## WELL CONSTRUCTION AND COMPLETION SUMMARY

| | | |
|---|---|---|
| Drilling Method: Cable tool | Sample Method: Drive barrel Hard tool | WELL NUMBER: 299-W22-42 TEMPORARY WELL NO: |
| Drilling Fluid Used: Water | Additives Used: None | Hanford Coordinates: N/S N 36,052.7 E/W W 73,079.6 |
| Driller's Name: G. Lydin | WA State Lic Nr: Not documented | State NAD83 Coordinates: N 134,452.20m E 567,623.16m |
| Drilling Company: Kaiser Engineers Han | Company Location: Richland, WA | Start Card #: Not documented T___ R___ S___ |
| Date Started: 12Feb90 | Date Complete: 15May90 | Elevation Ground surface (ft): 688.20 Brass cap |

Depth to water: 227.0-ft Apr90
(Ground surface) 230.6-ft Dec91

GENERALIZED STRATIGRAPHY — Geologist's Log

5↔30: SAND
35: Slightly muddy SAND
40,45: SAND
50: Gravelly SAND
55↔150: SAND
155: Slightly muddy SAND
160: Muddy SAND
165,170: Sandy MUD
175↔185: Muddy SAND
190,195: Gravelly muddy SAND
200,205: Muddy SAND
210,215: Slightly gravelly sandy MUD
220,225: Sandy MUD
230: Muddy SAND
235↔245: Muddy sandy GRAVEL



Elevation of reference point: [691.16-ft]
(top of casing)
Height of reference point above ground surface [3.0-ft ]

Depth of surface seal [18.8-ft ]

Type of surface seal:
Cement grout

10 3/4-in nominal hole to 137.7-ft.

I.D. of riser pipe: [4-in ]
Type of riser pipe:
Type 304 stainless steel

Diameter of borehole: [9-in nom]
137.7↔243.4-ft

Type of filler, 18.8↔215.2-ft:
Bentonite crumbles
8↔20 mesh

Bentonite pellets, 1/2↔3/8-in
215.2↔219.7-ft

Depth top of sand pack: [219.7-ft]
40-mesh silica sand
to 243.2-ft

Depth top of screen: [223.1-ft]
4-in, #10-slot, Johnson type 304 stainless steel, wire wrapped, with bottom cap.

Depth bottom of screen: [243.4-ft]

Depth bottom of borehole: [243.4-ft]

Drawing By: RKL/2W22-42.ASB Date: 19Jun92

Reference: WHC-MR-0208, October 1990
KEH Survey Data Report 18Jun90

## SUMMARY OF CONSTRUCTION DATA AND FIELD OBSERVATIONS
## RESOURCE PROTECTION WELL - 299-W22-42

| | | |
|---|---|---|
| WELL DESIGNATION | : | 299-W22-42 |
| CERCLA UNIT | : | 200 Aggregate Area Management Study |
| RCRA FACILITY | : | 216-U-12 |
| HANFORD COORDINATES | : | N 36,052.7 W 73,079.6 |
| LAMBERT COORDINATES | : | NAD83 N 134,452.20m E 567,623.16m |
| DATE DRILLED | : | May90 |
| DEPTH DRILLED (GS) | : | 243.4-ft |
| MEASURED DEPTH (GS) | : | 243.4-ft |
| DEPTH TO WATER (GS) | : | 227.0-ft, Apr90;<br>230.6-ft, Dec91 |
| CASING DIAMETER | : | 4-in, stainless steel, ~+1.0–223.1-ft;<br>6-in stainless steel, +3.0–~0.5-ft (not documented) |
| ELEV TOP CASING | : | 691.16-ft |
| ELEV GROUND SURFACE | : | 688.20 (Brass cap) |
| PERFORATED INTERVAL | : | Not applicable |
| SCREENED INTERVAL | : | 223.1–243.4-ft, 10-slot, stainless steel |
| COMMENTS | : | FIELD INSPECTION:<br>OTHER: |
| AVAILABLE LOGS | : | Driller |
| TV SCAN COMMENTS | : | Not applicable |
| DATE EVALUATED | : | Not applicable |
| EVAL RECOMMENDATION | : | Not applicable |
| LISTED USE | : | Water levels measured, 20Nov90–10Dec91;<br>Not on water sample schedule |
| PUMP TYPE | : | Hydrostar |
| MAINTENANCE | : | |

## WELL CONSTRUCTION AND COMPLETION SUMMARY

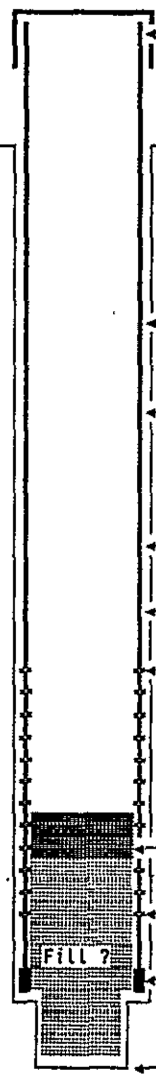
| | | |
|---|---|---|
| Drilling Method: Cable tool | Sample Method: Hard tool (nom) | WELL NUMBER: 699-38-70   TEMPORARY WELL NO: |
| Drilling Fluid Used: Water | Additives Used: Bentonite | Hanford Coordinates: N/S N 38,142   E/W W 70,226 |
| Driller's Name: Swain | WA State Lic Nr: Not documented | State Coordinates: N 443,264   E 2,225,001 |
| Drilling Company: Not documented | Company Location: ND | Start Card #: Not documented   T___ R___ S___ |
| Date Started: 17May57 | Date Complete: 14Jun57 | Elevation Ground surface (ft): Not documented |

Depth to water: 270-ft Jun87

GENERALIZED STRATIGRAPHY   Driller's Log

0→5: SAND
5→15: Small GRAVEL
15→25: Sandy SILT-GRAVEL
25→30: SILT, coarse SAND
30→45: Sandy SILT
45→55: SAND-SILT-GRAVEL
55→70: SAND-SILT
70→72: SAND-small GRAVEL
72→80: SAND-coarse and clean
80→120: SAND-SILT
120→130: SAND-SILT (harder packed)
130→190: SAND-SILT
190→200: SAND-SILT-small GRAVEL (water)
200→205: SAND-SILT-small GRAVEL
205→220: SAND-SILT
220→230 SAND-SILT, soft, more CLAY than SAND
230→245: Small GRAVEL-CLAY
245→250: CLAY
250→260: CLAY-GRAVEL
260→265: SAND-SILT-GRAVEL
265→310: SAND-GRAVEL, mostly clean
310→315: SAND-GRAVEL, a little SILT
315→320: SAND-SILT-GRAVEL-CLAY
320→335: SAND, SILT and GRAVEL
335→345: SAND-GRAVEL
345→350: Clean coarse SAND
350→360: Fine clean SAND
360→365: SAND
365→369: SAND-small GRAVEL
369→375: SAND-hardpacked
375→380: SAND-softer, very fine
380→390: SAND-SILT, very fine
390→395: SAND-GRAVEL
395→400: SAND
400→413: Fine SAND and SILT (caving)

REMEDIATIONS:
Jun 64, Crowe
Installed plastic piezometer tubes
Jul75, M. Bultena, cleaned well
Jul77, Bigham. set cement plug




Elevation of reference point: (top of casing) [710.67-ft]

Height of reference point above ground surface [ND]

Depth of surface seal [ND]

Type of surface seal: None documented

I.D. of surface casing (If present) [ND]

DRILLER'S NOTE: Casing may be parted at joint 50 ft from top

I.D. of riser pipe: [8-in]
Type of riser pipe: Carbon steel

Diameter of borehole: [9-in nom]

Type of filler: Not documented

Elevation/depth top of seal
Type of seal: Not documented

Depth top of perforations: [255-ft]
255→320-ft, 3 cuts/ft
320→380-ft, 2 cuts/2 ft

Cement plug, ~ 300→310-ft

Depth bottom of perforations: [380-ft]

Depth bottom of casing: [388-ft]

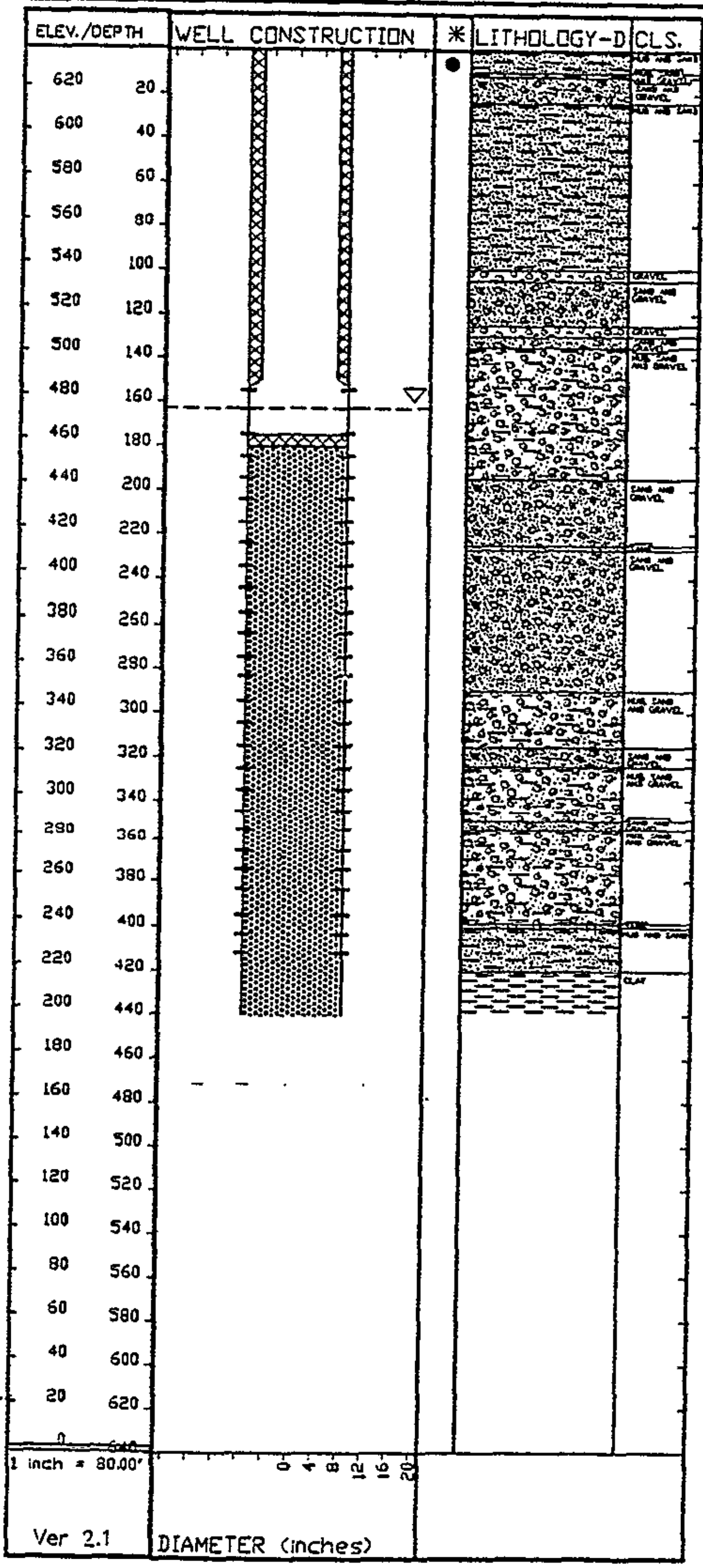
Depth bottom of borehole: [413-ft]

Drawing By: RKL/6N38W70.ASB   Date: 29Jun92

Reference: HANFORD WELLS

| | | | |
|---|---|---|---|
| WELL NAME | 699-37-82A | COMPLETION DATE | 10/10/60 |
| CASING ELEV. | 636.75 Feet | INITIAL | |
| WELL DEPTH | 175.00 Feet | DEPTH TO WATER | 163.0 ft |
| DRILL DEPTH | 440.00 Feet | | |
| COORDINATES N-S | 37018 P | | |
| E-W | -81988 P | | |





J.S.

Date Received: 1-12-93 DS

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WHC-SD-EN-TP-021 Rev. 0

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Title Aquifer Test Plan for the 200 West Groundwater Aggregate Area

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Impact Level 3Q

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Author/Requestor (Printed/Signature) Date
LC Swanson LC Swanson 1/4/93

Intended Audience
[] Internal [] Sponsor [X] External

Responsible Manager (Printed/Signature) Date
RL Jackson RL Jackson 01/04/93

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OFFICIAL DOCUMENT
NS
Date 1-29-93

Date Cancelled

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